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ABSTRACT

Data collected during the Anchor Test Study norming phase were used to investigate substantive relationships between reading achievement and school, classroom, and pupil variables. School characteristics, such as location, public or private, socioeconomic level, and percentage minority enrollment, were found to be related to achievement in reading as measured by the Metropolitan Achievement Tests. Reported IQ, race or ethnicity, primary language, and the diagnosis of a reading problem were significant correlates of reading achievement. Ability grouping and class size, the classroom variables studied, were not related to reading proficiency. The interrelationships among selected pupil and school characteristics were analyzed in addition to the univariate relationships of pupil variables to reading achievement. An overview of the Anchor Test Study and detailed descriptions of the methodologies used in the present study are provided. (EVH)

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ANCHOR TEST STUDY

School, Classroom, and Pupil Correlate
of
Fifth-Grade Reading Achievement

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NCES 77-123

ANCHOR TEST STUDY

School, Classroom, and Pupil Correlates
of
Fifth-Grade Reading Achievement

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PREFACE

This report, based on the 1972 Anchor Test Study (ATS), was initiated in June of 1975 as a contractual activity of the National Center for Education Statistics (NCES). The original study was undertaken to provide a common base, or "anchor," for equating various standardized reading test scores needed by the U.S. Office of Education to evaluate its Elementary and Secondary Education Act (ESEA) Title I reading programs. This report analyzes and interprets some of the data collected in the original study; the findings are summarized in the first section.

Westat, Inc. conducted the study, with Dr. Kenneth Burgdorf as Project Director. This report, in turn, was prepared under his direction by Abt Associates Inc., with John Doucette and Robert St. Pierre as authors.

In NCES the work was carried out by Milton Chorvinsky as a project of the former Division of Intergovernmental Statistics and its Data Requirements and Projects Branch, headed by Absalom Simms and George H. Brown, respectively. The latter, now head of the newly formed Postsecondary and Vocational Analysis Branch in the Division of Postsecondary and Vocational Education Statistics, retains responsibility for any remaining activities of the ATS project.

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INTRODUCTION AND SUMMARY OF FINDINGS

This monograph contains an analysis and interpretation of data collected in the course of the 1972 Anchor Test Study. In that study, data were collected from 65,399 fifth-grade pupils in 845 schools for the purposes of equating scores on several different tests of reading achievement and creating new national norms for these tests. In addition to test scores, data were gathered on a number of relevant school, classroom and pupil variables. The purpose of this monograph is to examine the Anchor Test Study data base, to identify variables and issues of educational and policy interest, and to report the findings in the context of previous research.

Limitations of the Data

As explained more fully elsewhere in the report, this study has a number of limitations that the reader should keep clearly in mind in reading the report as a whole or in reading the highly condensed summary of principal findings presented below. The most important of these limitations are:

1. The data on which this study is based are essentially descriptive. They often do not include the kinds of measures that would be needed for analytically evaluating alternative hypotheses as to why one category of students scores higher in reading achievement than another.

2. In view of the well-known positive relationship between scholastic achievement and socioeconomic status (which is confirmed in the present study) it would be highly desirable to have an impeccable measure of this important variable. Unfortunately, the measure actually used, which is the best that could be devised from the available data, was less than optimal. It is based solely on estimates, made by the test coordinator of each participating school, of the percentage of children in the school who came from families in certain income categories and of the percentage of children whose families were on welfare. (The actual formula for computing Socioeconomic Level (SEL) is described in Section 1.3.4.) It should be noted that this index applies to the school, not the student. All sample subjects who attended the same school necessarily were assigned the same SEL value: high, middle, or low.

3. Many of the relationships stated below--between reading achievement and various school, pupil, and classroom variables--are undoubtedly influenced by the socioeconomic variable. Where the data permitted, statistical adjustments were made in an attempt to equalize the effects of SEL differences. Such adjustments generally reduced substantially the differences in reading scores among the groups being compared. It is possible that such differences would have been reduced still further if the socioeconomic variable could have been measured and controlled in a more rigorous fashion.

Summary of Findings

A summary of the major findings of this study follow. Findings are presented with respect to school, pupil, and classroom characteristics. Finally, findings about relationships between these characteristics and reading achievement are presented.

1. School Characteristics.

- Location of School: Pupils attending schools in suburban, small, or middle-sized cities had higher average reading scores than pupils attending school in rural areas who, in turn, had higher average reading scores than pupils in large cities.
- Control of school: Pupils attending nonpublic schools had higher average reading scores than pupils attending public schools.
- School socioeconomic level: Pupils attending high socioeconomic level schools had higher average reading scores than pupils attending middle socioeconomic level schools who, in turn, had higher average reading scores than pupils enrolled in low socioeconomic schools.
- Grade-five percent minority enrollment: An inverse relationship was observed between percent minority enrollment of a school and the average reading scores of all fifth-grade pupils in those schools. Pupils attending schools with 0-10 percent minority enrollment had the highest average, more than a full standard deviation above the average for pupils attending schools with over 75 percent minority enrollment. The inverse relationship mentioned above also prevailed when the data were analyzed separately for Caucasian, Black, and Spanish-surnamed pupils. It was not possible, with the available data, to evaluate the role that SEL differences may have played in mediating this relationship.

2. Pupil Characteristics

- Remedial reading diagnosis: Pupils diagnosed as not needing remedial reading services had higher average reading scores than pupils diagnosed as being in need of those services.

- Primary Language: Pupils classified as speaking English as their primary language had higher average reading scores than pupils classified as being educationally handicapped by not speaking English as their primary language.

- Racial/ethnic group: Oriental and Caucasian pupils had higher average reading scores than Black pupils. American Indians and Spanish-surnamed pupils averaged slightly higher than Blacks. The numbers of Orientals and American Indians in the sample were too small to provide reliable means.

- Reported IQ: A strong positive relationship was observed between reported IQ and average reading scores.

3. Classroom Characteristics

- There were no discernible differences in the average reading scores of pupils who are and are not ability grouped once school socioeconomic level is held constant.

- There were no observable relationships between class size and reading achievement.

4. Relationships Among Selected Pupil and School Characteristics

- The difference in average reading scores among types of school location were found to be attributable mainly to other school characteristics (school sociceconomic level and grade-five percent minority enrollment), although maximum mean differences as large as five points remained after adjustments were made for these characteristics.

- Eight percent of the pupils diagnosed as needing remedial reading services scored above the 50th percentile on the MAT, while 19 percent of the pupils not so diagnosed scored below the 25th percentile. This indicates that there is some overlap in the distributions of reading scores for these two sets of pupils, perhaps as a result of misclassification or of varying criteria for diagnosis.

- Most pupils classified as being educationally handicapped due to bilinguality were Spanish-surnamed. This is consistent with the fact that Spanish-surnamed people are probably the largest group of not native-English-speakers in the country. Not surprisingly, pupils so diagnosed had a lower average reading score than Spanish-surnamed pupils not so diagnosed. However, the latter group still scored lower than Caucasian pupils.

- The socioeconomic level of schools, as measured in this study, appeared to have only a small effect on the differences in reading achievement among pupils of different racial/ethnic groups.

- The standards for diagnosing remedial reading need appeared to differ with a pupils' racial/ethnic group. The average reading score of Caucasian pupils diagnosed as needing remedial services was almost the same as the average reading score of Black pupils who are not diagnosed as needing such service.

- While a large part of the observed negative relationship between percent minority enrollment and reading achievement could be explained by school socioeconomic level and pupil racial/ethnic group, pupils attending schools with 1-10 percent minority enrollment still had a higher average reading score than pupils attending schools with 36-100 percent minority enrollment. The reader should bear in mind the limitations of our SEL measure, however, as explained near the beginning of this summary.

Organization of the Report

This report is organized into six chapters. The first provides background concerning the Anchor Test Study and the present analysis. The second chapter addresses school-level variables and their relationship to reading achievement, both independently and in pairs. The third chapter presents information about the univariate relationship of pupil variables to reading achievement, while the fourth considers selected pairs of pupil and school variables. Chapter five contains an examination of reading achievement with ability grouping and class size, the two classroom variables. Finally, Chapter six presents the conclusions of the study. In addition, several appendices are included, which provide detailed information about procedures and methodologies used in this report together with additional data for the tables presented in the body of the report.

1.0 BACKGROUND

1.1 The Anchor Test Study

In 1968, an effort to evaluate ESEA Title I reading programs led the United States Office of Education (USOE) to conclude that, although pupil scores on standardized reading achievement tests were available from many elementary schools throughout the country, such data were not useful in evaluation studies of national scope. The problem was that different school systems utilized different tests to measure reading achievement, and scores were not comparable from one test to another.

In response to this problem, USOE developed specifications for a major study which would provide a means of translating a pupil's score on any one of eight widely used reading tests into an equivalent score on any of the other seven tests. In addition, new national norms were to be provided for all eight tests. The design required that one instrument - the Metropolitan Achievement Tests (MAT) - would serve as a common base, or "anchor" against which the other tests were to be equated and normed. Consequently, the project became known as the "Anchor Test Study."

The Anchor Test Study involved two concurrent data gathering efforts in April, 1972: the "equating phase" and the "restandardization (or norming) phase." The equating phase entailed administration of all eight tests, in counterbalanced combinations of two tests per school, to a total of 134,855 fourth, fifth and sixth-grade pupils. The resulting data were used to develop a series of equivalency tables showing, for each raw score on any one test, the percent-equivalent raw score on all seven other tests. The norming phase involved administration of the vocabulary ("Word Knowledge") and reading comprehension ("Reading") subtests of the MAT to all fourth, fifth and sixth-grade pupils in a stratified random sample of 940 schools. Usable test data were obtained from 192,749 pupils in 90.4 percent of eligible schools. (See Appendix A for a more complete discussion of response rates.) As a result of this effort, new nationally representative norms were obtained for the two subtests and for the MAT "Total Reading" scale (formed by summing the scores of the two subtests). Finally, the equating and norming phase findings were combined to produce new and comparable norms for the remaining seven tests.

During the norming phase data collection process, considerable information was obtained about the characteristics of the schools, classrooms, and pupils contained in the sample. This information was not used in the original study, however, except as it pertained to the norming and equating efforts. It is these data, together with MAT reading scores, that provide the basis for the present monograph.

1.2 The Present Study

Recognizing that data collected during the Anchor Test Study norming phase provide a unique opportunity for investigation of substantive relationships between reading achievement and a number of seemingly important school, classroom, and pupil variables in a large, nationally representative sample of pupils, the National Center for Education Statistics (NCES) awarded a contract in July, 1975 for the performance of such an investigation. This contract was awarded to a consortium of two research firms, Westat, Inc. and Abt Associates Inc.

The project design called for the MAT Total Reading score to be used as the operational definition of reading achievement and for the fifth-grade segment of the norming phase sample to be the sample upon which analyses would be performed. This sample consists of 65,399 fifth-grade pupils drawn from 845 schools. Additional information about the sample design is presented in Appendix A.

The project specifications called for the production of an extensive series of tabulations describing the MAT Total Reading performance of fifth-grade pupils who possess certain characteristics, as defined by selected combinations of ten "independent variables." These variables include four school-level variables (control, location, socioeconomic level, and percent minority in grade five), two classroom-level variables (enrollment and ability grouping), and four pupil-level variables (racial/ethnic group, primary language, remedial reading diagnosis, and reported IQ). Production of a total of 42 tables, representing various two- and three-way combinations of these variables, was specified in a preliminary analysis plan.

For each characteristic investigated (i.e., for each category of the above independent variables and for each combination of categories specified in the analysis plan), a total of eleven statistics were produced: the number of pupils and schools in the sample; the estimated number and percent of pupils in the population; national estimates of the MAT Total Reading mean, standard deviation, and standard error of the mean, national estimates of the proportions of pupils who score below the 50th and 25th percentiles on the MAT Total Reading scale, and standard errors of these two proportions. These tables were presented without interpretation in a Preliminary Tabular Report issued by NCES in 1976. A listing of tables contained in that report may be found in Appendix F. Appendix C describes the statistical methodology used in the preparation of these tables.

Following production and examination of the initial tabulations, several additional tables (not included in the preliminary report) were produced, and the present monograph was prepared. The purposes of this monograph are: (a) to describe major findings concerning relationships between the above-mentioned "independent variables" and fifth-grade reading achievement as measured by the MAT Total Reading scale, (b) to describe the manner and extent to which these variables interact with one another or are otherwise interdependent in relation to reading achievement, and (c) to assess the significance of the findings in context of previous research. Readers desiring statistical information beyond that presented in this report or information concerning combinations of variables other than those discussed here are referred to the Preliminary Tabular Report.

Further information about the Preliminary Tabular Report, the present monograph, or the original Anchor Test Study may be obtained from:

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1.3 Definition of Variables

In this section the dependent and independent variables investigated in the present study are defined. All data were collected in April, 1972 as part of the norming phase of the Anchor Test Study. Information concerning school and classroom characteristics was reported by "School Coordinators" (generally school principals or their designates). Pupil information was reported by "Test Administrators" who were, in most cases, the pupils' homeroom teacher. Facsimiles of the instruments used to collect these data are presented in Appendix B.

1.3.1 Reading Achievement

The dependent variable of this study is the Total Reading scale raw score for Form F of the Metropolitan Achievement Tests (MAT), Intermediate Level, 1970 Edition. The Total Reading scale consists of two subtests, "Word Knowledge" and "Reading." In Word Knowledge, the pupil is presented with 50 stimulus words arranged roughly in increasing order of difficulty and, for each, is instructed to select a synonym (or antonym) for the stimulus from among four possible answers. The Reading subtest consists of eight paragraphs, each of which is followed by four to eight comprehension questions. The subtest contains a total of 45 questions, all in multiple choice format. As with Word Knowledge, four possible answers are listed for each question, and the pupil is asked to choose the one which is correct, given the information in the preceding paragraph.

The MAT is designed for group administration and machine scoring. A pupil's score on the Total Reading scale is the total number of questions answered correctly. Thus, the range of possible scores is 0-95. The scale is reported by its publishers to have an odd-even reliability of .96 (Harcourt Brace Jovanovich, 1973).

1.3.2 School Location

School location was determined from the school coordinator's answer to the following question: "Which of the following descriptions best defines the location of your school?" Possible responses are:

- Large city, over 500,000 population
- Large city, over 200,000 population
- Middle-size city, 50,000-200,000 population
- Small city or town, less than 50,000 population
- Suburb of a middle-size or large city
- Rural area near a middle-size or large city
- Rural area not near a middle-size or large city

For three of the 845 sampled schools, the school coordinator did not provide this information. School location was determined from the school address in these cases.

1.3.3 Control of School

The original Anchor Test Study sample selection process included provision for obtaining a nationally representative sample of schools in each of three categories: public, Catholic, and nonpublic non-Catholic. Schools originally classified as "Catholic" or "nonpublic non-Catholic" were combined for analytic purposes because the sample for nonpublic non-Catholic schools (255 pupils) was too small to permit separate analyses. The resulting categories are:

- Public
- Nonpublic

1.3.4 School Socioeconomic Level

School socioeconomic level (SEL) was determined from the school coordinator's answers for two questions: "Estimate the percentages of pupils in your school who come from households in which the total yearly income from all sources falls within the following ranges."

- under $3,000
- $3,000-$5,999
- $6,000-$9,999
- $10,000 and over,

and "Give your best estimate of the percent of pupils in your school who are members of families whose primary means of support is a public welfare program:"

- none
- 1-10 percent
- 11-25 percent
- 26-50 percent
- 51-75 percent
- 76-90 percent
- 91-100 percent

These two items were combined through use of an algorithm designed to classify schools as falling in the upper quarter, middle two quarters, or lower quarter of an SEL distribution. The resulting classification is:

- high (at least 40 percent of families have incomes of $10,000 or above, no more than 20 percent have incomes under $6,000; and no more than 10 percent are primarily supported by public welfare programs)
- low (no more than 10 percent of families have incomes of $10,000 or more and at least 60 percent have incomes under $6,000; or more than 50 percent are primarily supported by public welfare programs)
- middle (neither high nor low as defined above)

In cases where percent welfare was not reported, schools were classified on the basis of income alone. If income was not reported, it was estimated from community income data obtained during original Anchor Test Study sample selection.

1.3.5 Pupil Racial/Ethnic Group

The racial/ethnic group of each pupil was determined from the test administrator's answer to the following question: "Of which one of the following racial or national original groups is this pupil a member?"

- American Indian
- Black/Negro
- Oriental
- Spanish-Surnamed American
- Caucasian (except Spanish-Surnamed American) or Other - referred to as "Caucasian" throughout the following text

In cases where the test administrator did not provide this information, racial/ethnic group was coded as "not reported".

1.3.6 Primary Language of Pupil

The primary language of each pupil was determined from the test administrator's answers to the following questions: "Is this pupil's primary language English?" and (if no), "You have indicated that this pupil's primary language is not English. In your opinion, does this fact constitute a learning handicap for the pupil in reading and most other academic subjects?" From responses to these questions, pupils were categorized as follows:

- English is primary language;
- English is not primary language; this is not felt to constitute a learning handicap for pupil;

- English is not primary language; this is felt to constitute a learning handicap for pupil:
- Not reported (response combinations other than above or no response)

1.3.7 Remedial Reading Diagnosis for Pupil

Remedial reading diagnosis for each pupil was determined from the test administrator's response to the following question: "Has this child been specifically diagnosed as needing corrective or remedial work in reading by someone other than the classroom teacher?" Categories are:

- diagnosed need (yes)
- no diagnosed need (no)
- not reported (don't know or no response)

1.3.8 Reported IQ of Pupil

The reported IQ of each pupil was determined from the test administrator's response to the following question: "Which of the following IQ ranges on your most recently administered standardized intelligence test best described this pupil?"

- Below 75
- From 75 to 89
- From 90 to 110
- From 111 to 125
- Above 125
- No IQ test administered

In cases where the administrator reported that no IQ test had been administered or when no response was given to the above question, the item was coded as "not reported".

1.3.9 Grade-Five Percent Minority of School

Grade-five percent minority in each school was determined by computing the percent of tested pupils in a school whose "racial/ethnic group" was reported by the test administrator as being other than Caucasian, as defined above. Schools were classified into the following categories for tabulation purposes:

- 0 percent minority
- 1-10 percent minority
- 11-35 percent minority
- 36-75 percent minority
- 76-100 percent minority

Only two schools did not report racial/ethnic information for at least 50 percent of their fifth-grade pupils. Percent minority information obtained during original Anchor Test Study sample selection was used to classify these schools.

1.3.10 Classroom Ability Grouping

Classroom ability grouping was determined from the school coordinator's classification of the pupil's classroom as:

- not ability grouped
- ability grouped: above average
- ability grouped: average
- ability grouped: below average

1.3.11 Classroom Enrollment

Classroom enrollment was determined from the school coordinator's report of the number of pupils enrolled in the sampled pupil's classroom on the day the report form was received (early April, 1972). For tabulation purposes, the following categories were used:

- 1-23 pupils enrolled
- 24-27 pupils enrolled
- 28-31 pupils enrolled
- 32-34 pupils enrolled
- 35 or more pupils enrolled

1.4 Content and Interpretation of Univariate Tables

As noted earlier, eleven statistics were computed for each category of each independent variable and for all table cells arising from selected two- and three-way combinations of variables. In describing overall project findings for individual variables, all eleven statistics will be presented.

Table 1-1 illustrates the format to be used in the presentation of such "univariate" findings. This table contains a single column presenting Anchor Test Study statistics as computed from the total fifth-grade sample. Later univariate tables will contain this "total" column but will also contain columns representing each category of the variable under discussion. Table 1-1 is presented at this point both to acquaint the reader with the purpose and import of the various statistics and to provide baseline information about the statistical characteristics of the total fifth-grade sample and population.

Table 1-1.--Statistics for total fifth-grade sample and population from the Anchor Test Study: United States, spring, 1972

Statistic	Grade 5 Total
Sample size:	
Number of pupils	65,399
Number of schools	845
Estimated population size:	
Number of pupils (in thousands)	4,009
Percent of pupils	100.0
Estimated MAT reading achievement:	
Mean	53.6
Percent scoring below 50th percentile	51
Percent scoring below 25th percentile	25
Standard deviation	18.2
Estimated standard error of:	
Mean	0.25
Percent below 50th	0.6
Percent below 25th	0.5

The first section of Table 1-1 presents the number of pupils (65,399) and schools (845) contained in the fifth-grade segment of the Anchor Test Study sample. These two entries indicate the size of the data base upon which other statistics -- all of which are national estimates derived from sample data -- are based. Generally, the greater the number of sampled pupils and schools upon which a given estimate is based, the greater the degree of confidence which may be placed in the accuracy of that estimate. This applies to estimates of sampling error as well as to estimates of means, standard deviations, and the like. Although there is no single cutoff point to distinguish "accurate" from "inaccurate" estimates, a useful rule of thumb is that estimates based upon a sample of 25 or more schools may be regarded as at least moderately accurate, but estimates based upon fewer than 25 sampled schools should be treated with caution.* Throughout this report, all estimates derived from samples of less than 25 schools will be indicated as such (through use of table footnotes) to alert the reader to the need for caution in interpreting results.

The next section of Table 1-1 presents estimates of the total number (in thousands) and percent of fifth-grade pupils who were enrolled in the nation's schools in the spring of 1972. The estimated total number of pupils is approximately 4,009,000 and this, of course, represents 100 percent of the estimated total fifth-grade population. These population distribution data represent basic demographic information which is of interest in its own right but, at the univariate level, is of little substantive import. However, these statistics will be of considerable value in later sections of this report, where they will play a major role in clarifying interdependencies among variables.

The next section of Table 1-1 contains several statistics which provide summary estimates of the reading achievement (as measured by the MAT Total Reading scale) of the total fifth-grade pupil population. These include three indices of level of achievement: the estimated MAT mean and the estimated percentages of pupils who score below the MAT 50th and 25th percentiles, as defined by the Anchor Test Study national norms

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*See Appendix D which discusses the rationale for selecting 25 schools as a cutoff.

(Loret, et al., 1974, p. 78).* These three statistics convey much the same information, but do so in somewhat different ways. The mean is a direct estimate of average level of reading achievement while the estimated percent below the 50th percentile tells how many pupils in a given subpopulation (i.e., what percentage) are below the national median in reading achievement.** The estimated percent below the 25th percentile may be viewed as an index of how many members of the subpopulation are "substantially" below average. The estimated MAT Total Reading scale mean for the total fifth-grade population is 53.6. The estimated percentages below the 50th and 25th percentiles are, of course, very close to 50 and 25 percent, respectively. This is hardly surprising since these estimates were derived from the same sample that was used to construct the national percentile norms.

The fourth statistic in this section of Table 1-1 is the estimated standard deviation of the MAT Total Reading score. This is an index of the extent to which members of a given population or subpopulation differ from one another in level of reading achievement. If the distribution of Total Reading scores is approximately "normal" (i.e., symmetrical and bell-shaped), approximately 68 percent of the scores will fall within one standard deviation of the mean. The estimated standard deviation for the total fifth-grade population is 18.2. This suggests that about 68 percent of fifth-graders obtain MAT Total Reading scores between 35 (53.6 - 18.2) and 72 (53.6 + 18.2).

The final section of Table 1-1 presents the standard errors associated with the estimated mean and with the estimated percentages below the 50th and 25th percentiles. These standard errors indicate the probable extent to which their associated estimates may differ from "true" population values as a result of sampling error. The probability is about .68 that the "true" population value falls within one standard error of the estimated value. The standard error of the estimated total population mean is very small, 0.25. This suggests that the probability is .68 that the actual MAT Total Reading scale mean for all fifth-grade pupils during April of 1972 was between 53.35 (53.6 - 0.25) and 53.85 (53.6 + 0.25). The standard errors associated with the estimates of the percentages of all fifth-grade pupils who score below the 50th and 25th percentiles are also very small: 0.6 and 0.5, respectively. Estimates based upon smaller samples will, of course, tend to have larger standard errors.

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* Based upon these norms, a MAT Total Reading scale score of 54 or less falls below the 50th percentile, and a score of 38 or less falls below the 25th percentile.

** The 50th percentile, or median, is an index of central tendency which is not necessarily synonymous with the mean, or arithmetic average. However, the overall distribution of MAT Total Reading scale scores in the Anchor Test Study norming sample is a close enough approximation to the classic "normal curve" that the mean and median are essentially identical.

1.5 Content and Interpretation of Multivariate Tables

After univariate findings for a given set of variables (e.g., school-level variables) are presented, selected two and three-way combinations of variables will be examined to assess ways in which the variables may be interdependent in their relationship to reading achievement. For each "cell" in such multivariate tables (i.e., for each combination of categories of the variables in question), three statistics will be presented: the estimated number and percent of pupils in the population and the estimated MAT Total Reading scale mean for those pupils. Additional statistics (number of schools, number of pupils, and the standard error of the mean) are presented in Appendix E.

Two (or more) variables may be interdependent in relation to reading achievement in either or both of two ways. First, there may be an "interaction" between the variables: the relationship between one variable and reading achievement may be different for different categories of a second variable. Such would be the case, for example, if no difference in average level of reading achievement is found between public and nonpublic schools which are located in suburbs but large differences between the two types of schools are found in all other location categories. Such interactions will be readily apparent from an examination of mean achievement scores.

The above example illustrates how the relationship of one variable to reading achievement may be contingent upon another variable. It is also possible that the relationship of one variable to reading achievement may to some extent be a consequence of its association with another variable. For example, assume that high socioeconomic level schools tend to be concentrated in suburbs and that there is a strong positive relationship between school socioeconomic level and reading achievement. If suburban schools were found to have a higher average level of reading achievement than schools in other locations, one would wonder about the extent to which the location difference is attributable to the influence of SEL or, more specifically, to the covariance of location with SEL. This kind of issue will arise frequently, since the variables examined in this study tend to be strongly interrelated.

In the case stated above, one may pose and attempt to answer a hypothetical question: what would the location means have been if the proportions of high, middle and low SEL schools had been the same in each location category as for the nation as a whole? Assume that, nationwide, the proportions of high, middle and low SEL schools are .25, .50, and .25, respectively. Within each location category, one may multiply the estimated means for high, middle and low SEL schools in that category by these proportions and then sum the products. This simple procedure, a form of covariance adjustment, effectively adjusts the univariate location means to eliminate the influence of SEL. This means adjustment procedure will be utilized throughout this report, wherever it appears that univariate findings for one variable may be substantially attributable to the influence of another variable. For other applications of this technique see Wiley (1976).

1.6 Statistical Significance and Educational Importance

The major data to be presented in this report are estimates of average level of reading achievement for various segments of the fifth-grade population -- specifically, estimated MAT Total Reading scale means. From a descriptive point of view, the findings will be largely self-explanatory. Estimated means will be presented, along with information which permits the reader to assess the probable accuracy of the estimates -- the number of schools and pupils in the sample and the estimated standard errors of the mean.* The only reservation we have about these data is that the estimates of standard errors are themselves of questionable accuracy when the sample size is small (e.g., when the number of schools represented in the sample is less than 25). Appendix D presents a generalized variance estimation method which we would recommend using in such situations.

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* For multivariate tables, accuracy of estimation statistics are presented in Appendix E.

Although estimates of average reading achievement for individual segments of the fifth-grade population are of interest, interpretation of findings inevitably focuses upon differences between achievement of one population subgroup and that of another -- e.g., is the average reading achievement of public school pupils higher or lower than that of nonpublic school pupils? A classic question thus arises: When is a difference between two estimates large enough to warrant attention?

One answer to this question is that the difference must be statistically reliable, i.e., the likelihood must be remote that the obtained difference could have occurred solely on the basis of chance. The subject of statistical significance is discussed in Appendix D, where the following formula is shown to provide a simple method of assessing the statistical reliability of the difference between two estimated means:

$$z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\sigma^2_{\bar{x}_1} + \sigma^2_{\bar{x}_2}}}$$

where $\bar{x}_1$ and $\bar{x}_2$ are the estimated means for the two groups being compared, and $\sigma_{\bar{x}_1}$ and $\sigma_{\bar{x}_2}$ are the estimated standard errors of the mean for the two groups.

If z is greater than 1.96 in absolute value, the difference is "statistically significant" at the $p<.05$ level. Throughout this report, the criterion of statistical significance is regarded as one which must be met in order for a difference between the estimated mean for one group and that for another to be worthy of attention.

We should note, however, that a difference which is statistically significant is not necessarily important from an educational point of view. Many of the estimates to be reported are based upon extraordinarily large samples of schools and pupils and, consequently, have very small standard errors. This implies that differences of only one or two points will often be sufficient for statistical significance. Conversely, even substantial differences between subgroups as defined by one variable may later turn out to be largely attributable to the influence of another variable. For these reasons, we feel there is no simple way to determine whether or not a given difference is "important". We shall use our judgment in identifying differences which seem particularly noteworthy or interesting to us, but the reader should feel free to make additional observations.

1.7 Limitations of the Study

When interpreting the data presented in the following sections, the reader is advised to keep the following limitations in mind.

A. The data are not population values, but rather are estimates of varying precision. The Anchor Test Study sample was designed to yield reliable estimates for the fifth-grade population as a whole and for certain major subclassifications of this population. However, when the sample is simultaneously subclassified in terms of two or more variables, a number of cells in the resulting table may contain very few (if any) sampled pupils, and estimates computed for such cells tend to be imprecise. This report is limited to a presentation of tables which do consist primarily of cells for which the sample size is large enough to permit reasonably accurate estimates. This is not the case for all cells of all tables, however, and the reader is advised to exercise caution in the interpretation of findings for individual cells. Reference to the accuracy of estimation information contained in Appendix E is recommended.

B. This study is well designed for identifying and describing ways in which pupil reading achievement is associated with the type of school or classroom attended, but it is extremely limited in its capability to explain why such relationships occur. The Anchor Test Study was not intended to provide a basis for analytic research, and it did not attempt to obtain the kinds of measures which would be needed for an in-depth exploration of alternative hypotheses as to why the average reading achievement of pupils in one type of school or classroom might be higher or lower than that of pupils in another. The absence of any direct measures of pupil motivation or socioeconomic background is particularly limiting in this respect. This study is not in a position to institute statistical controls over such variables and, consequently, is not able to assess the extent to which school or classroom differences in achievement are attributable to other factors -- per pupil expenditures, emphasis upon the teaching of reading skills, overall quality of instruction, etc. The variables available from the Anchor Test Study permit some exploration of alternative interpretations of findings but, typically, the analyses will raise more questions than they answer.

C. The Metropolitan Achievement Test Total Reading scale is a convenient and useful measure of the extent to which pupils have acquired basic reading skills, but it is not an exact or complete measure. Its two subtests certainly do not tap the full range of skills involved in reading. Moreover, the test is administered in a group context. One would hope that all of the pupils tested made a serious effort to "do their best" on the test and that they were well-rested and alert when the test was administered. There is no way to know whether this was actually the case, however, or to rule out the possiblity that obtained test scores may substantially underestimate or overestimate actual reading skills for certain kinds of pupils.

D. Recently, considerable interest has developed in the issue of whether or not the average level of educational attainment of American public school pupils has changed over the past several years. The data presented in this report were obtained at essentially a single point in time (April, 1972), and thus do not address the question of change. The possibility exists that some and perhaps many of the findings presented in this report are no longer relevant because of recent changes in the structure of American education. In the absence of information to the contrary, however, we are inclined to assume that the basic nature of relationships among the variables discussed in this report is not greatly different today than it was in 1972.

E. Finally, it should be noted that an unknown number of pupils were intentionally excluded from participation in the Anchor Test Study -- pupils with severe physical, mental or emotional handicaps who, in the judgment of local school officials, were incapable of taking the MAT. Although obviously necessary, these exclusions may introduce some degree of bias in the data. Assuming that such pupils tend to have relatively poorly developed reading skills, one might anticipate that the Anchor Test Study data tend to overestimate the average level of reading achievement, especially for those segments of the population in which such pupils are concentrated. The extent of such bias is unknown, but it is assumed to be slight.

2.0 SCHOOL CHARACTERISTICS AND READING ACHIEVEMENT

2.1 Introduction

This chapter describes relationships between grade-five reading achievement as measured by the Metropolitan Achievement Test Total Reading Scale and four school characteristics:

- school location (seven categories ranging from large cities to rural areas);
- school control (public vs. nonpublic);
- grade-five percent minority enrollment (five categories ranging from 0 to 100 percent); and
- school socioeconomic level (high, middle, low)

These four variables are discussed in turn. For each characteristic, a summary of the previous research literature is presented and the overall relationship of the variable to reading achievement is discussed. This is followed by an examination of bivariate relationships between pairs of school characteristics and reading achievement.

2.2 Location of School

Pupils in both highly urban and rural areas have consistently been found to have lower levels of reading achievement than students in suburbs (Coleman, et al., 1966; National Assessment of Educational Progress, 1974). Studies of pupils in rural communities have similarly shown that rural students perform less well than nonrural, when urbanism is treated as a dichotomous variable (Fitzsimmons, 1976; Herriott and Hodgkins, 1973; and U.S. Department of Agriculture, 1967). However, when the effects of social and economic variables have been statistically controlled by regression techniques, findings regarding location have changed. In separate reanalyses of the "Coleman Report" data, Jencks (1972a) and Smith (1972) each found the independent effect of "location" to be in fact quite small. NORC (1973) reported a similar finding, when the covariance between location and socioeconomic status was taken into account. However, the confounding of the independent relationship between location and achievement by socioeconomic variables continues to occur in the literature.

The lack of adequately designed comparisons of urban and rural communities limits the generalizability of much of the existing literature, as noted by Randhawa and Fu (1973). While some well-designed studies do exist (e.g., Edington, 1971), their availability and scope are restricted. Many of the national studies that involve both urban and rural communities have been program evaluations and have been intentionally structured to eliminate any possible influence of location on the assessment of program outputs.* Finally, the lack of a standard terminology to describe and measure school location has also led to some confusion regarding the association between location and achievement. Such terms as urban and nonurban, suburban and nonsuburban, and rural and nonrural have been used in a number of studies but have seldom been defined in exactly the same way from study to study.

The achievement of fifth-grade pupils attending schools in different locations, as reported in the Anchor Test Study data is examined below. These data will allow us to avoid some of the problems cited earlier by making direct comparisons among location categories and later, by taking the effects of socioeconomic level and other variables into account. (The effect of SEL on pupil achievement will receive considerable attention in several other sections of this report.)

Table 2-1 presents eleven Anchor Test Study statistics for the fifth-grade sample and population, classified by school location. Almost three-quarters of the population (73 percent) live in cities with populations under 50,000, suburbs, or rural areas. The remaining 27 percent of the population live in cities with populations ranging upwards from 50,000.

It may also be seen that reading scores vary widely across school locations. The average scores for pupils attending schools in suburbs and cities with populations under 200,000 are in the middle and high 50's, about one-half standard deviation higher than the average reading scores in cities of 200,000 or more population. Pupils in rural areas average between these two groups. Findings concerning the proportions of students

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* For example, an evaluation of the Emergency School Assistance Program conducted by the National Opinion Research Center (NORC, 1973) reported certain findings separately for urban and rural fifth and tenth-grade pupils in the South, but did not report any explicit comparison of the achievement of these two groups.

Table 2-1.--Statistics for fifth-grade sample and population from the Anchor Test Study by school location: United States, spring, 1972

Statistic	School location							
	Total	City of over 500,000	City of 200,000 to 500,000	City of 50,000 to 199,999	City of under 50,000	Suburb of city of over 50,000	Rural area near city of over 50,000	Rural area not near city of over 50,000
Number of pupils in sample	65,399	8,866	2,817	6,917	16,955	14,578	7,192	8,074
Number of schools in sample	845	88	38	93	310	161	99	156
Estimated number of pupils in population (in thousands)	4,009	481	179	418	1,019	811	481	620
Percent of estimated number of pupils	100.0	12.0	4.5	10.4	25.4	20.2	12.0	15.5
MAT Total Reading mean	53.6	46.2	47.6	55.9	55.5	58.4	52.9	50.7
MAT Total Reading standard deviation	18.2	19.1	18.9	18.4	18.6	17.6	18.0	18.6
MAT Total Reading standard error of mean	0.25	1.12	2.01	0.88	0.60	0.53	0.74	0.69
Percent of pupils below the 50th percentile	51.0	67.0	63.0	46.0	47.0	40.0	53.0	57.0
Standard error below 50th	0.6	2.4	4.0	2.0	1.3	1.2	1.7	1.5
Percent of pupils below the 25th percentile	25.0	41.0	37.0	21.0	22.0	16.0	24.0	30.0
Standard error below 25th	0.5	2.5	4.8	1.7	1.2	1.0	1.6	1.6

scoring below the 50th and 25th percentiles reflect the same pattern: suburbs and middle-sized to small cities have the lowest percentages of pupils scoring "below average", rural areas the next, and large cities the highest. About forty percent of the pupils in cities with populations over 200,000 are estimated to score at or below the 25th percentile while only 16 percent of suburban area pupils do so. The standard deviation of the reading scores for pupils in each location closely approximates that of the total population; that is, the variability of scores within each location is about the same.

In sum, pupils in suburbs and cities with population under 200,000 have the highest average reading scores, substantially above those for pupils in large cities, who have the lowest average scores. Pupils in rural areas have intermediate average scores, slightly below the national average. This is consistent with previous findings and will be explored further in Section 2.6 where the bivariate relationships of school location and other variables to reading achievement are discussed. In these bivariate tabulations the two "rural area" categories and the two "large city" categories will be combined, to produce larger cell sizes and more reliable estimates than would otherwise be possible.

2.3 Control of School

For purposes of this study, schools were classified as either public or nonpublic. Parochial and other private Catholic schools represent by far the largest component of the nonpublic sector. Based on the Anchor Test Study, an estimated 88.3 percent of fifth-grade pupils who are enrolled in nonpublic schools attend Catholic schools.

A good deal of information is available concerning the comparative achievement of public and Catholic school pupils. One recent review of this literature noted that, in the standardization samples for several national achievement tests (such as the Iowa Tests of Basic Skills, the Comprehensive Tests of Basic Skills, and the California Tests of Academic Achievement), the achievement norms for Catholic school pupils are considerably higher than those for the nation as a whole (Erickson and Madaus, 1971). This same review described several studies in which Catholic school pupils in various cities were found to have mean achievement test scores above the national average.

Table 2-2 presents Anchor Test Study statistics for the fifth-grade sample and population, by type of school attended: public or nonpublic. It may be seen that, of the estimated 4,009,000 fifth-grade pupils in the nation, an estimated 90.4 percent attended public schools. These enrollment figures compare favorably with estimates derived from the NCES Elementary-Secondary General Information Survey (ELSEGIS) for the 1971-1972 school year. The ELSEGIS estimate that a total of 3,833,000 fifth-grade pupils were enrolled in public schools differs from the Anchor Test Study estimate (3,623,000) by only five percent (Scott, 1975). Similarly, the ELSEGIS estimate that 10.3 percent of all elementary and secondary pupils were enrolled in nonpublic schools compares favorably with the Anchor Test Study estimate of 9.6 percent (for grade-five only).

Table 2-2 reveals a large difference between the estimated average reading scores of public and nonpublic school pupils. The estimated nonpublic school mean of 61.4 is about one-half standard deviation above the public school estimate (52.8). It is estimated that only one-third of nonpublic school fifth-graders score below the national average, as compared to 53 percent of public school pupils. Similarly, only an estimated nine percent of nonpublic school pupils score below the 25th percentile, as compared to 27 percent of public school pupils.

As noted earlier, the nonpublic school sector consists primarily, but not entirely, of Catholic Schools. The Anchor Test Study sample of non-Catholic nonpublic schools (255 pupils from 14 schools) is too small to permit detailed analysis. However, it is noteworthy that pupils attending non-Catholic private schools have a somewhat higher estimated reading mean than Catholic school pupils (64.4 vs. 61.1).

The basic Anchor Test Study finding that, on the average, nonpublic school pupils obtain considerably higher reading achievement test scores than public school pupils is in accord with previous research findings. As has been the case with earlier research, however, the finding is difficult to interpret. One possibility is that nonpublic schools are doing a better job of teaching basic reading skills than schools in the public sector. It is also possible, however, that the difference in achievement is largely (and perhaps entirely) a result of factors other than sector differences in content or quality of instruction.

Table 2.2.--Statistics for fifth-grade sample and population from the Anchor Test Study by control of school: United States, spring, 1972

Statistic	Control of school		
	Total	Public	Nonpublic
Number of pupils in sample	65,399	60,407	4,992
Number of schools in sample	845	740	105
Estimated number of pupils in population (thousands)	4,009	3,623	386
Percent of estimated number of pupils	100.0	90.4	9.6
MAT Total Reading mean	53.6	52.8	61.4
MAT Total Reading standard deviation	18.2	18.4	15.7
MAT Total Reading standard error of mean	0.25	0.26	0.63
Percent of pupils below the 50th percentile	51.0	53.0	33.0
Standard error below 50th	0.6	0.6	1.7
Percent of pupils below the 25th percentile	25.0	27.0	9.0
Standard error below 25th	0.5	0.6	1.0

Nonpublic schools differ from public schools in numerous ways, many of which may have consequences for educational achievement. First, nonpublic schools are free to accept or reject pupils on the basis of academic aptitude, motivation, deportment, or other criteria. The extent to which children with learning disabilities, poor motivation, or other achievement-relevant liabilities are systematically screened out of the nonpublic school system is unknown but could well be an important factor in accounting for the achievement differences noted above.

A second potentially important factor is self-selection. Since most nonpublic schools charge tuition, it may be assumed that parents who send their children to such a school believe it has something to offer that is not available at the local public school and are sufficiently interested in their children's education to pay for this "something extra." Consistent with this hypothesis, parents of children in parochial schools have been found to have greater interest in and information about their children's school activities than parents of public school children in the same neighborhoods (Erickson, Madaus and Greaney, 1970). Socioeconomic factors must also be considered. Greeley and Rossi (1960), for example, found that poor and uneducated Catholic parents are relatively unlikely to send their children to available parochial schools. These same authors noted a relatively high degree of homogeneity among Catholic school pupils as compared to public school pupils and argued that this commonality factor alone may have led to higher levels of achievement than would otherwise have been expected.

As with most previous research, the present study is unable to isolate or assess the relative importance of the many factors which may explain the comparatively high level of reading achievement of pupils attending Catholic and other nonpublic sector schools. We can only agree with Erickson and Madaus (1971) that:

> "While we know that Catholic school students generally score higher on the average than public school students on tests of academic achievement, the extent to which this difference is attributable to the effects of Catholic schools per se is unknown" (p. VIII-9).

2.4 Grade-Five Percent Minority

The desegregation of formerly racially isolated schools has caused fears in some quarters that the academic achievement of students in these schools (both minority and majority) would be adversely affected by desegregation. The best-known survey of the relationship between school racial/ethnic composition and achievement is the Equality of Educational Opportunity study, which reported a negative relationship between extent of minority enrollment and achievement, (Coleman, et al., 1966). Later reanalysis of these data concluded that, despite some methodological weaknesses, this basic conclusion was accurate (Jencks, 1972a).

Table 2-3 presents Anchor Test Study statistics for the fifth-grade sample and population, classified by school percent minority in grade-five. It may be seen that an estimated 22.2 percent of fifth-graders attended schools containing no minority group pupils in grade-five, and an additional 37.5 percent attended schools with less than 11 percent minority enrollment. At the other extreme, an estimated 11.7 percent of fifth-graders attended schools with minority enrollments of more than 75 percent.* Only 28.6 percent attended schools with mid-range minority enrollment (11-75 percent).

The estimated mean reading score for pupils in schools with no grade-five minority pupils, 58.7, is about one-third standard deviation above the overall population mean and is essentially identical to the mean for pupils whose schools fall into the 1-10 percent minority category (58.6). The mean scores for pupils in schools with more than 10 percent minority enrollment are all below the population mean, and decrease as the percentage of minority enrollment increases. Pupils in schools with minority enrollments of more than 75 percent have an estimated mean of 37.3, more than a full standard deviation below the estimate for pupils in schools with 10 percent or less minority enrollment. The proportions of pupils scoring at or below the 50th and 25th percentiles are relatively low (40 percent and 15 percent, respectively) for schools with 10 percent or less minority enrollments. As percentage of minority enrollment increases

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* More detailed analysis indicates that the distribution is even more skewed than these figures indicate. For example, an estimated 85 percent of pupils who attended schools with minority enrollments below 11 percent were enrolled in schools of less than 6 percent minority, and an estimated 6.2 percent of pupils attending schools with over 75 percent minority enrollment were actually in schools of above 95 percent minority enrollment.

Table 2-3.--Statistics for fifth-grade sample and population from the Anchor Test Study by grade-five percent minority: United States, spring, 1972

Statistic	Grade-five percent minority					
	Total	0	1-10	11-35	36-75	76-100
Number of pupils in sample	65,399	12,107	25,223	13,154	6,127	8,788
Number of schools in sample	845	220	307	161	70	87
Estimated number of pupils in population (thousands)	4,009	891	1,504	792	354	468
Percent of estimated number of pupils	100.0	22.2	37.5	19.8	8.8	11.7
MAT Total Reading mean	53.6	58.7	58.6	51.7	45.5	37.3
MAT Total Reading standard deviation	18.2	16.9	17.1	18.3	18.5	15.7
MAT Total Reading standard error of mean	0.25	0.41	0.33	0.50	0.76	0.73
Percent of pupils below the 50th percentile	51.0	40.0	40.0	56.0	69.0	85.0
Standard error below 50th	0.6	1.1	0.8	1.2	1.7	1.4
Percent of pupils below the 25th percentile	25.0	14.0	15.0	28.0	42.0	61.0
Standard error below 25th	0.5	0.7	0.5	1.1	1.8	1.9

above 10 percent, so do the proportions of pupils scoring below the 50th and 25th percentiles. In schools where minority pupils comprise more than three-quarters of the total fifth-grade enrollment, an estimated 85 percent of the student body score below the 50th percentile and 61 percent score below the 25th percentile. The standard deviation of reading scores is relatively low for pupils in schools with small (less than 11 percent) or large (more than 75 percent) minority enrollments, indicating that pupils in these schools tend to be relatively more homogeneous in reading achievement than pupils in schools with mixed enrollments.

In sum, there is a strong inverse relationship between reading achievement and the percentage of minority pupils enrolled in a school: pupils in schools with low minority enrollments tend to have relatively high average scores while pupils in schools with high minority enrollments tend to have much lower averages.

While previous research has found that a high concentration of minority students in a classroom is associated with relatively low levels of academic achievement, an observation corroborated by the Anchor Test Study data, it cannot be assumed that these two variables are causally related. In fact, there is some evidence to suggest that the relationship between racial concentration and academic achievement may largely result (among other things) from the covariance of race with pupil socioeconomic status (Wilson, 1967). Several major studies of school productivity have explicitly rejected the hypothesis that racial concentration "causes" low achievement. For example, Wilson (1967) concluded that:

> "Given similar social-class compostions, the racial balance of a school has slight bearing on the academic performance of students. (Social class and racial composition are, of course, closely correlated.)" (p. 202)

Coleman et al. (1966) reached a similar conclusion :

> "The higher achievement of all racial and ethnic groups in schools with greater proportions of white students is largely, perhaps wholly, related to effects associated with the student body's educational background and aspirations. This means that the apparent beneficial effect of a student body with a high proportion of white students comes not from racial composition per se, but from the better educational background and higher educational aspirations that are, on the average, found among white students." (p. 307)

The relationships among percent minority enrollment, racial/ethnic group, and school socioeconomic level will be explored further in Section 2.6 and in Chapter Four.

2.5 Socioeconomic Level of School

The relationship between socioeconomic status (SES) and student achievement has been one of the most consistent and powerful findings of the research on academic achievement, holding for a wide range of outcome measures and for many definitions of SES as noted in recent reviews by Bryant, et al. (1974) and Randhawa and Fu (1973). This relationship has also persisted for analyses of the effects of SES conducted at the school level, the classroom level and for individual pupils with much the same results. For example, Mayeske et al. (1970) report that an aggregate SES school variable created by averaging the individual SES of each student accounted for approximately the same proportion of the variance in achievement for sixth-grade pupils as individually reported data.* What controversy regarding SES exists in the literature does not concern the existence of the relationship per se, but the best ways in which to capture the effect of SES. Many variables have been used to measure pupil SES including family income, rent, parental education, occupation of household head and the presence of selected items in the home, including indicators of income and general and special educational environments. Such items have been found to be highly intercorrelated and the results in explaining pupil achievement have been reasonably invariant.

The basis for many later studies of the relationship between SES and achievement was the Equality of Educational Opportunity study, the so-called "Coleman Report" (Coleman, et al., 1966). Coleman's purpose in conducting this study was to investigate the relationship of certain school characteristics to the achievement and affective characteristics of students of different races. The study of social class was a secondary objective; consequently, little attention was directed explicitly to the measurement of SES, as such. Instead, Coleman's approach was to report results for individual variables thought to be indicators of SES, including mother's education and the presence of various items (such as encyclopedias) in the home. Such variables were individually found to be associated with achievement. Later reanalyses of the Coleman data, such as those performed by Mayeske, et al. (1970) and Smith (1972) created and analyzed composite measures of SES assembled from pupil-level variables in Coleman's data base. These studies have found SES to account for about 25 percent of the variance in grade-six achievement (Mayeske, et al., 1970, pp. 16-17). Virtually every other major study of school productivity has related measures of SES to pupil outcomes. For example, Project TALENT, using a national sample of 2,900 twelfth-grade males, found SES items to account for 28 percent of the variance in measures of general information (Flanagan, 1964). As measures of student output became more abstract, the percentage of variance explained decreased to a low of six percent.

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* Further research has confirmed this type of aggregate measure as a valid estimate of school-level SES effect (Herriott and Hodgkins, 1973).

The above research has been based on pupil-level SES data, either analyzed at the pupil level or studied as a school-level factor created by aggregating data for individual pupils. The Anchor Test Study uses a somewhat different measure termed school socioeconomic level (SEL), which is based upon School Coordinators' estimates of the average income and welfare status of the families served by each sampled school (see Section 1.3.4). Research concerning relationships between similar school-SES measures and pupil achievement have yielded findings generally similar to that for pupil-level SES and for pupil-level data aggregated to school level. Herriott and St. John (1966), for example, concluded that "Achievement in reading dramatically differentiates pupils in schools of different SES levels" (p. 204). Similarly, Wilson (1959, 1963) studied the interaction of pupil and school SES and found that each made an independent contribution to differences in academic achievement and aspirations. Thus, it appears that while school-level measures of average family affluence behave generally like pupil and aggregate pupil-level SES measures, the two are not entirely interchangeable.

Table 2.4 presents Anchor Test Study statistics for fifth-grade pupils reported for three categories of school socioeconomic level (SEL). Approximately one-quarter of the pupils in the population attended schools classified as being of low-SEL, another quarter attended high-SEL schools, and the remaining half attended middle-SEL schools. This distribution reflects the method in which the school SEL measure was constructed (see Section 1.3.4).

Table 2-4.--Statistics for fifth-grade sample and population from the Anchor Test Study by school SEL: United States, spring, 1972

Statistic	School SEL			
	Total	High	Middle	Low
Number of pupils in sample	65,399	15,484	35,119	14,796
Number of schools in sample	845	188	451	206
Estimated number of pupils in population (thousands)	4,009	909	2,155	946
Percent of estimated number of pupils	100.0	22.7	53.8	23.6
MAT Total Reading mean	53.6	61.6	54.5	43.9
MAT Total Reading standard deviation	18.2	16.8	17.7	18.1
MAT Total Reading standard error of mean	0.25	0.41	0.35	0.62
Percent of pupils below the 50th percentile	51.0	32.0	50.0	72.0
Standard error below 50th	0.6	1.0	0.8	1.3
Percent of pupils below the 25th percentile	25.0	11.0	22.0	45.0
Standard error below 25th	0.5	0.6	0.8	1.5

There are large differences in the mean reading scores across the three levels of SEL. Pupils attending high-SEL schools have an estimated mean (61.6) which is about one-half standard deviation higher than the estimate for pupils in middle-SEL schools (54.5). The latter mean in turn is about one-half standard deviation above the estimated mean for pupils in low-SEL schools (43.9). Similarly, the proportions of pupils in high-SEL schools who score below the 50th and 25th percentiles (32 and 11 percent, respectively) are much lower than the comparable proportions for pupils from low-SEL schools (72 and 45 percent, respectively). Finally, the standard deviations of MAT scores increase slightly as school SEL decreases, indicating that pupils attending high-SEL schools are somewhat more homogeneous in terms of reading achievement than pupils in low-SEL schools.

In conclusion, there is a strong relationship between school SEL and pupils' average reading scores: the estimated mean for pupils in high-SEL schools is about one standard deviation higher than that for pupils in low-SEL schools. In other words, pupils attending schools in affluent areas tend to have a considerably higher average level of reading achievement than pupils attending schools in relatively poor neighborhoods. Because the Anchor Test Study data base lacks information about individual pupil SES, it will not be possible to determine the extent to which these findings reflect relationships between achievement and pupil-level SES characteristics (such as family income, parental aspirations, etc.), relationships between achievement and aggregate pupil SES characteristics (such as peer aspirations, group values related to achievement, etc.) and/or relationships between achievement and community SES factors, school financial resources, quality of school facilities, teacher salary and experience, etc.). Any or all of these relationships may be reflected in the findings discussed above.

2.6 Interrelationships Among School Characteristics

The following sections examine the bivariate relationships between reading achievement and each pair of the four school characteristics discussed above. Because the number of school location categories is relatively large, we have collapsed the classification of school location into five categories (for bivariate analysis). This results in larger cell sizes and more reliable estimates of population characteristics in these cells.

2.6.1 School Control and Socioeconomic Level

Table 2-5 presents Anchor Test Study population and reading achievement estimates for fifth-grade pupils cross-classified in terms of school control and school socioeconomic level. Looking first at the estimated mean achievement test scores, it may be seen that the strong univariate relationships of both control and SEL with reading achievement noted in previous sections are again evident: the estimated nonpublic school mean is higher than that for public schools at all three SEL levels, and the estimated SEL means fall in high-middle-low sequence for both nonpublic and public sector schools. As one goes from higher to lower-scoring categories, the effects of these two variables appear to be somewhat cumulative. Thus, the public-nonpublic difference is about twice as great among low-SEL than among high-SEL schools (11 points, as compared to five points), and the high-low SEL difference is a good deal larger for public than for nonpublic schools (18 points, as compared to 11 points). Put another way, the statistical disadvantage of attending a public school is apparently greater if one lives in a low-SEL neighborhood than if one lives in a high-SEL area, and the disadvantage of living in a low-SEL neighborhood is statistically greater if one attends a public school than if one attends a nonpublic school.

The population distribution estimates contained in Table 2-5 indicate that, while nonpublic schools tend to be somewhat higher in SEL than public schools, the public-nonpublic difference in SEL distribution is not great. An estimated 29.2 percent of the fifth-grade pupils who attend nonpublic schools are in high-SEL schools, and the comparable estimate for public school pupils is only a slightly lower 22.0 percent.

2.6.2 School Control and Location

Table 2-6 presents the estimated number and percent of fifth-grade pupils in the nation and their estimated MAT Total Reading means, by school control and location. Looking first at the means, it may be seen that each variable has the same general relationship to reading

Table 2-5.-- Estimated number and percent of pupils and estimated MAT Total Reading mean, by control of school and by socioeconomic level of school: Grade 5, United States, Spring 1972.

Socioeconomic level of school	Control of school								
	Total			Public			Nonpublic		
	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean
	Number‡	Percent		Number‡	Percent		Number‡	Percent	
Total	4,009	100.0	53.6	3,623	100.0	52.8	386	100.0	61.4
High	909	22.7	61.6	796	22.0	61.0	113	29.2	65.8
Middle	2,155	53.7	54.5	1,935	53.4	53.8	219	56.8	61.0
Low	946	23.6	43.9	891	24.6	43.3	54*	14.0*	54.2*

‡ Estimated number in thousands
* Estimate based upon sample of less than 25 schools.

Table 2-6.-- Estimated number and percent of pupils and estimated MAT Total Reading mean, by control of school and by location of school: Grade 5, United States, Spring 1972.

School location	Control of school								
	Total			Public			Nonpublic		
	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean
	Number‡	Percent		Number‡	Percent		Number‡	Percent	
Total	4,009	100.0	53.6	3,623	100.0	52.8	386	100.0	61.4
Large city: over 200,000	660	16.5	46.6	567	15.6	44.8	94*	24.2*	57.2*
Middle-sized city: 50,000-200,000	418	10.4	55.9	374	10.3	55.2	44*	11.4*	62.4*
Small city: under 50,000	1,019	25.4	55.5	910	25.1	54.7	109	28.1	62.2
Suburb of city of 50,000 or more	811	20.2	58.4	701	19.4	57.5	110	28.4	64.5
Rural area	1,101	27.5	51.7	1,071	29.6	51.5	30*	7.8*	58.8*

‡ Estimated number in thousands.
* Estimate based upon sample of less than 25 schools.

achievement within the categories of the other variable as for the nation as a whole. Thus, the estimated mean for nonpublic school pupils is substantially higher than that for public school pupils in all location categories, and the estimated means for the five location categories are in the same rank order for nonpublic schools as for public schools.

One mean - that for large city public schools - is noticeably "out of line" with the others, however. This mean, 44.8, is nearly seven points below that for the next lowest public school category (rural areas), and is nearly 13 points below the highest public school category (suburbs). Among nonpublic schools, large cities also have the lowest mean, but it is only 1.6 points below the next lowest category and only 7.3 points below the highest category. Thus, the relationship between school location and reading achievement is considerably less pronounced in the nonpublic than in the public sector and, among public schools, the major location finding is that schools in cities of over 200,000 population stand out from those in all other location categories by virtue of their pupils' unusually low average level of achievement. It may also be seen that, because the large city public school mean is so low, the difference between public and nonpublic schools is considerably bigger in large cities (over 12 points) than elsewhere, the difference being about seven points in each of the remaining four location categories.

The population distribution data in Table 2-6 indicate that public and nonpublic schools are not distributed similarly across the five location categories. In comparison to public schools, nonpublic schools are proportionately overrepresented in larger cities and suburbs and are underrepresented in rural areas.

Given the consistently higher level of achievement of nonpublic than public school pupils, this finding raises the possibility that, to some extent, the overall location means may simply reflect the varying degrees to which nonpublic schools are represented in the various locations. Table 2-7 presents the results of the means adjustment procedure described in Section 1.5, in this case designed to eliminate the effect of differential representation of public and nonpublic schools across the five locations. Because the number of pupils who attend nonpublic schools is relatively small in all location categories, the

Table 2-7.--Estimated MAT Total Reading mean and estimated MAT Total Reading mean adjusted for control of school, by school location: Grade 5, United States, spring, 1972

Statistic	School location				
	Large city: over 200,000	Middle-sized city: 50,000 to 200,000	Small city: under 50,000	Suburb of city of 50,000 or more	Rural area
Raw mean	46.6	55.9	55.5	58.4	51.7
Adjusted mean	46.0	55.9	55.4	58.2	52.2
Difference	-0.6	0.0	-0.1	-0.2	+0.5

adjusted location means are not greatly different from the unadjusted ones. It may be seen that the overall (unadjusted) mean for large city schools, already the lowest of the five locations, would have been even lower (by 0.6 points) were it not for the overrepresentation of nonpublic schools in large cities. Conversely, the rural area mean would rise (by 0.5 points) to within one point of the national average if that location had its "fair share" of nonpublic schools.

In sum, pupils enrolled in nonpublic schools have considerably higher estimated average reading achievement test scores than public school pupils in all location categories, and the major location finding - that pupils attending large city schools have considerably lower estimated mean MAT Total Reading scores than pupils at any other location - is primarily a public school phenomenon. The relatively poor performance of large city public school pupils is a subject that will be explored further as other cross-tabulations are presented.

2.6.3 School Location and Socioeconomic Level

The joint relationship of school location and socioeconomic level (SEL) to fifth-grade reading achievement is described in Table 2-8. It may be seen that the strong relationship between school SEL and average pupil reading achievement noted earlier is apparent within all location categories. The reverse is not true, however. Within each of the three SEL categories, rural areas, suburbs, and small and middle-sized cities all have approximately the same estimated average level of reading achievement (i.e., the means are all within three points of one another). Again, though, things are somewhat different for large city schools. The estimated mean for high-SEL large city schools (60.6) is comparable to those for other high-SEL schools, that for middle-SEL large city schools (49.9) is 4-7 points below the means for other middle-SEL schools, and the low-SEL large city mean (38.1) is 8-10 points below those for other low-SEL schools.

Table 2-8 also indicates that high, middle, and low-SEL schools are not evenly distributed across the five location categories. Thus, nearly half of suburban fifth-graders (48.6 percent) attend schools classified as high-SEL, as compared to only 14.2 percent of large city pupils and to an even lower 8.2 percent of rural area pupils. Conversely, only 4.6 percent of suburban students attend low-SEL schools, as compared

Table 2-8.-- Estimated number and percent of pupils and estimated MAT Total Reading mean, by socioeconomic level of school and by location of school: Grade 5, United States, Spring 1972.

School location	Socioeconomic level of school											
	Total			High			Middle			Low		
	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean
	Number‡	Percent		Number‡	Percent		Number‡	Percent		Number‡	Percent	
Total	4,009	100.0	53.6	909	22.7	61.6	2,155	53.8	54.5	946	23.6	43.9
Large city: over 200,000	660	100.0	46.6	94*	14.2*	60.6*	308	46.7	49.9	257	38.9	38.1
Middle-sized city: 50,000-200,000	418	100.0	55.9	119*	28.5*	61.9*	239	57.2	55.4	60*	14.4*	46.0*
Small city: under 50,000	1,019	100.0	55.5	211	20.7	61.7	584	57.3	56.8	224	22.0	46.2
Suburb of city of 50,000 or more	811	100.0	58.4	394	48.6	62.3	380	46.9	55.5	37*	4.6*	47.7*
Rural area	1,101	100.0	51.7	90*	8.2*	59.0*	643	58.4	53.9	368	33.4	46.0

‡ Estimated number in thousands.

* Estimate based upon sample of less than 25 schools.

to 38.9 percent of large city pupils and 33.4 percent of rural area pupils. Middle-sized and small cities have intermediate SEL distributions, roughly approximating national average.

These findings suggest that the overall differences among location categories discussed earlier (see Section 2-2) may largely reflect locational differences in SEL. Table 2-9 presents overall location means statistically adjusted to eliminate the influence of locational differences in SEL distributuion. It may be seen that most but not all of the originally noted variation among locations in average reading achievement is eliminated by this procedure and is thus attributable to SEL.

It is noteworthy, however, that the estimated mean for large city schools is still 3-6 points lower than the means for other locations even when SEL is taken into account. This reflects the finding, noted earlier, that pupils attending low (and, to a lesser extent, middle) SEL large city schools have considerably lower average reading scores than their SEL counterparts at all other locations.

In the previous section, it was noted that the unusually low average reading scores of pupils attending school in cities of over 200,000 population is primarily a public school phenomenon. Now we can go one step further and suggest that it is largely a low and middle-SEL public school phenomenon.

2.6.4 School Location and Grade-Five Percent Minority

The strong relationship between grade-five percent minority and reading achievement is basically the same within as across school locations. Table 2-10 shows that, for all locations, schools with minority enrollment under 11 percent have the highest scores, and average MAT scores progressively decline as minority enrollment percentage increases. Within percent minority classifications, however, locational differences are less pronounced than they are overall. Overall, the maximum difference among location means is about 12 points, whereas it is six points or less within all percent minority classifications.

The pattern of differences among locations is different in this table than in the cross-tabulations described earlier. Previously, large cities stood out from other locations as having unusually low average achievement scores. Table 2-10 indicates that, when school

Table 2-9.--Estimated MAT Total Reading mean and estimated MAT Total Reading mean adjusted for school SEL by school location: Grade 5, United States, spring, 1972

Statistic	School location				
	Large city: over 200,000	Middle-sized city: 50,000 to 200,000	Small city: under 50,000	Suburb of city of 50,000 or more	Rural area
Raw mean	46.6	55.9	55.5	58.4	51.7
Adjusted mean	49.6	54.7	55.4	55.2	53.2
Difference	+3.0	+2.8	-0.1	-3.2	+2.8

Table 2-10. -- Estimated number and percent of pupils and estimated MAT Total Reading mean, by Grade 5 percent minority of school and by location of school: Grade 5, United States, Spring 1972.

School location	Grade 5 percent minority of school																	
	Total			0			1-10			11-35			36-75			76-100		
	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean
	Number‡	Percent		Number‡	Percent		Number‡	Percent		Number‡	Percent		Number‡	Percent		Number‡	Percent	
Total	4,009	100.0	53.6	891	22.2	58.7	1,515	37.8	58.6	792	19.8	51.7	354	8.8	45.5	458	11.4	36.8
Large city: over 200,000	660	100.0	46.6	46*	7.0*	58.7*	132	20.0	57.2	125*	18.9*	51.5*	84*	12.7*	49.3*	274	41.5	36.4
Middle-sized city: 50,000-200,000	418	100.0	55.9	50*	12.0*	59.6*	166	39.7	60.8	138	33.0	54.6	37*	8.8*	45.1*	27*	6.5*	40.6*
Small city: under 50,000	1,019	100.0	55.5	252	24.7	60.9	375	36.8	59.3	224	22.0	53.0	102*	10.0*	43.9*	66*	6.5*	38.4*
Suburb of city of 50,000 or more	811	100.0	58.4	190	23.4	61.6	454	56.0	60.7	96*	11.8*	50.7*	48*	5.9*	47.7*	24*	3.0*	39.7*
Rural area	1,101	100.0	51.7	353	32.1	55.3	388	35.2	54.8	209	19.0	48.9	83*	7.5*	42.4*	68*	6.2*	34.6*

‡ Estimated number in thousands.
* Estimate based upon sample of less than 25 schools.

percent minority enrollment (for grade-five) is taken into account, large city schools do not have unusually low achievement scores. In all but one of the percent minority categories, the estimated mean for large city schools is essentially identical to the estimated overall mean for all schools in the category. The only category where this is not the case is that of schools with 36-75 percent minority. There, the estimated mean for large city schools (although of questionable reliability because of the small number of schools represented in the Anchor Test Study sample) is actually higher than the estimated mean for any other location. It is interesting to note that, for each of the percent minority classifications, schools located in rural areas have lower estimated MAT means than schools in any other location.

These findings suggest that previously noted overall achievement differences among locations may, to a considerable extent, reflect locational differences in percent minority. The population distributuion data presented in Table 2-10 indicate that there are indeed pronounced differences among locations in representation of schools with different percent minority enrollments. The most dramatic difference is that between large cities and all other categories in representation of schools with very high concentrations of minority group pupils. An estimated 41.5 percent of large city pupils attend schools with over 75 percent minority enrollment. This compares to estimates of 3.0 - 6.5 percent for all other locations.

Overall location means statistically adjusted to eliminate the effects of locational differences in school percent minority distribution are presented in Table 2-11. As suggested above, the previously noted deficit of large city schools in comparison to other location categories is largely "attributable" to the proportionate overrepresentation in large cities of schools with high concentrations of minority group pupils: the adjusted estimate of average reading achievement for large city pupils (53.3) is essentially identical to the average for the nation as a whole (53.6).

In sum, a strong negative relationship between average reading achievement and school percent minority enrollment is observed across all location categories. To a considerable extent, this relationship

Table 2-11.--Estimated MAT Total Reading mean and estimated MAT Total Reading mean adjusted for grade-five percent minority, by school location: Grade 5, United States, spring, 1972

Statistic	School location				
	Large city: over 200,000	Middle-sized city: 50,000 to 200,000	Small city: under 50,000	Suburb of city 50,000 or more	Rural area
Raw mean	46.6	55.9	55.5	58.4	51.7
Adjusted mean	53.3	55.6	54.7	55.4	50.3
Difference	+6.7	-0.3	-0.8	-3.0	-1.4

accounts for previously noted locational differences in achievement. This is not to say that overall locational differences in achievement are not "real," but rather that they are largely attributable to the influence of variables other than location, per se.

2.6.5 School Control and Grade-Five Percent Minority

Table 2-12 presents Anchor Test Study population and reading achievement estimates for fifth-grade pupils cross-classified by school control and grade-five percent minority enrollment. As can be seen from this table, nonpublic schools have higher estimated MAT Total Reading scale means than public schools across all levels of percent minority. However, the magnitude of the difference between public and nonpublic schools is directly related to the degree of concentration of minority group pupils: the difference for schools with minority enrollments of over 35 percent (about 15 raw score points) is three times as great as the difference for schools with minority enrollments of 0-35 percent (about 5 raw score points).

It may also be seen from Table 2-12 that there is a negative relationship between percent minority and reading achievement for nonpublic as well as public schools. However, this relationship is not nearly as strong in the nonpublic as in the public sector. Among nonpublic schools, those with percent minority enrollments ranging from zero to 75 percent do not differ significantly from one another in estimated average achievement. The drop-off does not occur until percent minority enrollment exceeds 75 percent. Even in the 76-100 percent category, however, the estimated nonpublic school mean (50.5) is only three raw score points below the national average.

By contrast, the estimated MAT Total Reading mean for pupils who attend public schools with 76-100 percent minority enrollment (35.9) is extremely low, about 18 raw score points below the national average. Translated into percentages, an estimated 87 percent of fifth-grade pupils who attend public schools where the minority enrollment is above 75 percent obtain MAT Total Reading scores below the national average and an estimated 65 percent of the pupils obtain scores below the 25th percentile.

As was the case for the relationship between school control and socioeconomic level, it appears that the statistical effects of school

Table 2-12. -- Estimated number and percent of pupils and estimated MAT Total Reading mean, by control of school and by Grade 5 percent minority of school: Grade 5, United States, Spring 1972.

Grade-five percent minority of school	Control of school								
	Total			Public			Nonpublic		
	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean
	Number‡	Percent		Number‡	Percent		Number‡	Percent	
Total	4,009	100.0	53.6	3,623	100.0	52.8	386	100.0	61.4
0	891	22.2	58.7	709	19.6	57.7	182	47.2	62.8
1-10	1,514	37.8	58.6	1,385	38.2	58.2	129	33.4	62.8
11-35	792	19.8	51.7	761	21.0	51.4	31*	8.0*	58.3*
36-75	354	8.8	45.5	340	9.4	44.9	14*	3.6*	60.3*
76-100	458	11.4	36.8	427	11.8	35.9	30*	7.8*	50.5*

‡ Estimated number in thousands.
* Estimate based upon sample of less than 25 schools.

control and percent minority are additive. On the average, pupils who attend public schools have lower reading achievement scores than pupils who attend nonpublic schools, pupils who attend schools serving predominantly minority group students have lower scores than pupils who attend schools with low minority enrollment, and pupils who attend schools which are both public and high in minority enrollment score lowest of all.

Turning now to the population distribution findings, Table 2-12 indicates that there is a substantial difference in the racial/ethnic compositions of public and nonpublic schools. It may be seen that nearly half of the fifth-graders in nonpublic schools (47.2 percent) attend schools containing no minority group students in the fifth-grade. By contrast, only one-fifth (19.6 percent) of public sector pupils attend such schools. At the other end of the spectrum, the figures are reversed: 42.2 percent of public sector pupils attend schools with minority group enrollments of over ten percent, as compared to only 19.4 percent of pupils in the nonpublic sector. These distributional differences notwithstanding, statistical adjustment of the estimated overall public and nonpublic sector means to eliminate the influence of differential minority group enrollment produces only small changes -- the estimated public school mean increases from 52.8 (unadjusted) to 53.0 (adjusted) while the estimated nonpublic school mean decreases from 61.4 (unadjusted) to 60.3 (adjusted). The effect is to reduce the overall difference between public and nonpublic schools, but not greatly (see Table 2-13).

2.6.6 School Socioeconomic Level and Grade-Five Percent Minority

The findings presented thus far indicate that school socioeconomic level and percent minority are similar in their relationships to reading achievement and to other school-level variables. The population distribution data presented in Table 2-14 indicate, as one might anticipate, that these two variables are also strongly related to one another. Schools which are high in SEL tend to be low in minority enrollment and conversely schools which are high in minority enrollment (i.e., above 75 percent) tend to be low in SEL. In the high-SEL category, an estimated 83.2 percent of the pupils attend schools with minority enrollments of under 11 percent, and only 2.6 percent of the pupils are estimated to attend schools with minority enrollments of more than 35 percent. In the low-SEL category,

Table 2-13.--Estimated MAT Total Reading mean and estimated MAT Total Reading mean adjusted for grade-five percent minority, by school control: Grade 5, United States, spring, 1972

Statistic	School control	
	Public	Nonpublic
Raw mean	52.8	61.4
Adjusted mean	53.0	60.3
Difference	0.2	-1.1

Table 2-14.-- Estimated number and percent of pupils and estimated MAT Total Reading mean, by socioeconomic level of school and by Grade 5 percent minority of school: Grade 5, United States, Spring 1972.

Grade 5 percent minority of school	Socioeconomic level of school											
	Total			High			Middle			Low		
	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean
	Number‡	Percent		Number‡	Percent		Number‡	Percent		Number‡	Percent	
Total	4,009	100.0	53.6	909	22.7	61.6	2,155	53.8	54.5	946	23.6	43.9
0	891	100.0	58.7	221	24.8	63.1	543	60.9	57.9	127	14.3	54.7
1-10	1,514	100.0	58.6	535	35.3	62.3	822	54.3	57.6	157	10.4	50.9
11-35	792	100.0	51.7	129	16.3	57.0	499	63.0	51.5	164	20.7	48.1
36-75	354	100.0	45.5	24*	6.8*	58.1*	167	47.2	46.6	164	46.3	42.6
76-100	458	100.0	36.8	**	**	**	124*	27.1*	41.2*	334	72.9	35.2

‡ Estimated number in thousands.
* Estimate based upon sample of less than 25 schools.
** Sample contains no pupils in this category.

the comparable estimates are 30.0 and 52.6 percent, respectively. It is also noteworthy that the Anchor Test Study sample of 845 schools - carefully selected to ensure adequate representation at all levels of SEL and percent minority - does not contain a single school which is both high in SEL and high (i.e., above 75 percent) in minority enrollment. No doubt such schools exist, but we are unable to make any estimate of their pupils' average level of reading achievement.

Turning to the reading achievement data contained in Table 2-14, it may be seen that for all percent minority categories the estimated means fall in the usual high-middle-low SEL sequence. Within SEL categories, the usual tendency for increases in percent minority to be associated with decreases in average reading achievement is also apparent. However, this relationship is not nearly as strong for high-SEL schools as for schools in the middle and low-SEL categories.

Table 2-15 presents the results of statistical adjustment of percent minority means for the effect of the covariance between percent minority and SEL. Since the Anchor Test Study sample contained no high-SEL schools in the 76-100 percent minority category, it was necessary for purposes of this adjustment to collapse the two highest percent minority categories. It may be seen that the highest resulting category of percent minority (36-100 percent) benefits considerably from this adjustment (the adjusted mean being 5.3 raw score points higher than the unadjusted mean) but that the three remaining categories are essentially unchanged by the adjustment. This suggests that some of the overall (unadjusted) variation in reading achievement among schools with different percentages of minority enrollment is attributable to the covariance between percent minority and SEL, but that schools with varying percentages of minority enrollment continue to differ from one another in average reading achievement even when SEL is controlled. This finding is in apparent conflict with earlier studies cited in Section 2.4 which have reported that the statistical association between school racial/ethnic composition and academic achievement essentially disappears when social class is held constant. It should be noted, however, that the present findings are not entirely comparable to those reported earlier, by virtue of the fact that the present school-level measure of SEL is not comparable to previously studied pupil-level measures of socioeconomic status. It is entirely

Table 2-15.--Estimated MAT Total Reading mean and estimated MAT Total Reading mean adjusted for socioeconomic level of school, by grade-five percent minority: Grade 5, United States, spring, 1972

Statistic	Grade-five percent minority			
	0	1-10	11-35	36-100
Raw mean	58.7	58.6	51.7	40.6
Adjusted mean	58.4	57.1	52.0	45.9
Difference	-0.3	-1.5	+0.3	+5.3

possible that, if a pupil-level index of socioeconomic status had been obtained in the Anchor Test Study, we too would have found this variable capable of accounting for the association between percent minority and reading achievement.

2.7 Summary of School-Level Findings

In this chapter, individual and joint relationships between four school characteristics (location, control, socioeconomic level, and grade-five percent minority) and pupil reading achievement were examined. For each of these characteristics, the overall (univariate) results were generally consistent with previous research findings. All four variables were found strongly associated with average pupil reading achievement as estimated from the Anchor Test Study data base. The major univariate findings were as follows:

- Location of school: Pupils attending suburban schools had the highest average MAT score (58.4), followed by pupils attending schools in middle-sized and small cities (both about 56), schools in rural areas (51.7) and, finally, pupils attending schools in large cities (46.6).

- Control of school: The estimated MAT mean for pupils attending nonpublic schools (61.4) was substantially higher than that for public school pupils (52.8).

- Socioeconomic level: Pupils attending high-SEL schools had a substantially higher estimated MAT mean (61.6) than pupils attending middle-SEL schools (54.5) who, in turn, had a substantially higher estimated mean than pupils enrolled in low-SEL schools (43.9).

- Grade-five percent minority: A strong inverse relationship was observed between the percent minority enrollment of a school and the estimated average level of reading achievement, the estimate for schools in the 0-10 percent range being highest (58.6), followed by schools with 11-35 percent minority (51.7), schools with 36-75 percent minority (45.5), and schools with above 75 percent minority (36.8).

The four school-level variables were also found to be highly related to one another, schools in the high-scoring category of one variable (e.g., high-SEL, nonpublic, suburban, or low percent minority) also tending to fall in the high-scoring categories of other variables. This tendency for schools to be multiply advantaged - or multiply disadvantaged - meant that, to some extent, the overall association between any one variable and reading achievement could be viewed as an indirect reflection of other variables' relationships to reading achievement.

For one variable, school location, almost all of the originally noted variation among categories in average reading achievement was found to be attributable to other school characteristics. When locational differences in SEL distribution were statistically controlled, achievement differences between suburbs, rural areas, and small and middle-sized cities were found to disappear. The notably poor average performance of pupils in the remaining location category, large cities, was not totally attributable to SEL, but was attributable to the finding that average reading achievement for schools with high minority enrollments is extremely low (at all locations) and that such schools tend to be concentrated in large cities. The proportionate overrepresentation of such schools in large cities was found sufficient to account for the overall difference between large cities and other location categories in average pupil reading achievement. These findings lead to a conclusion that school location, per se, is not an important determinant of reading achievement at the fifth-grade level. That is, when their schools' SEL and percent minority characteristics are taken into account, large city school systems do not appear to be any more or less effective than those in suburbs, small cities, or other locations in teaching basic reading skills.

The three remaining school-level variables, control, socioeconomic level, and percent minority, were found to interact with one another in their relationships to reading achievement, and the general form of the interaction between any two-way combination of these variables was always the same. Within the high-scoring category of any one variable, other variables' relationships to reading achievement were much less pronounced than for the middle or low-scoring categories of the variable. This was most clearly the case for school socioeconomic level. In all categories of all other variables, pupils attending high-SEL schools had estimated MAT means well above the national average. In other words, schools serving predominantly high-income populations tend to be well above average in reading achievement, pretty much irrespective of whatever other characteristics they might have - public vs. nonpublic, suburban location vs. large city or rural location, etc. For low-SEL schools, however, other characteristics mattered a great deal. The estimated MAT means for low-SEL schools varied over a 20-point range, from an above-average 54.7 to a substantially below-average 35.2.

In sum, the findings presented in this chapter indicate that average pupil reading achievement varies substantially and systematically as a function of three of the four major school characteristics examined--socioeconomic level, percent minority, and control (in roughly that order of importance). A fourth variable, school location, does not appear to have any significant independent relationship to reading achievement. The findings also indicate that the effects of these three major variables tend to be cumulative. Although not directly apparent from the tables presented in Chapter Two, one might anticipate that the highest estimated MAT mean would be obtained for pupils who attend high-SEL nonpublic schools containing no minority group pupils and that the lowest estimated mean would be for pupils attending low-SEL public schools with minority enrollments of over 75 percent. This is indeed the case, the estimated means being 68.8 and 34.8, respectively.

As suggested earlier, it is far easier to describe how schools differ in average reading achievement than to explain why these differences exist or to determine what, if anything, can or should be done to attempt to raise the achievement level of currently low-scoring schools. These issues will be explored further in later sections of this report.

3.0 PUPIL CHARACTERISTICS AND READING ACHIEVEMENT

3.1 Introduction

Chapter 2 described relationships between school characteristics and reading achievement. The present chapter will examine overall univariate relationships between fifth-grade reading achievement and each of four pupil-level characteristics: remedial reading diagnosis, primary language, racial/ethnic group, and reported IQ. Chapter 4, focusing primarily on the racial/ethnic group variable, will then continue the analysis by describing selected interrelationships among these pupil characteristics, as well as relationships between school and pupil characteristics.

3.2 Remedial Reading Diagnosis

Remedial reading diagnosis is a dichotomous variable reflecting the teacher's report of whether or not a given pupil has been officially diagnosed as needing remedial reading instruction. Table 3-1 contains statistics from the Anchor Test Study classified by remedial reading diagnosis. It may be seen that an estimated nine percent of all fifth-grade pupils were known by their teachers to have been diagnosed as requiring remedial reading instruction. The estimated average MAT Total Reading score of pupils so diagnosed is more than a full standard deviation below that of pupils not considered to require remedial instruction (35.3 vs. 56.4). Since standardized tests of reading skills were very likely used to determine if pupils required remediation, the difference in means is not surprising.

The standard deviation of the MAT Total Reading scores of pupils diagnosed as requiring remedial instruction is smaller than the population standard deviation (12.5 vs. 18.2). While the mean for pupils requiring remedial instruction is significantly lower than the mean score of pupils not so diagnosed, the size of the standard deviations indicates that the two groups' distributions do overlap. That is, some pupils diagnosed as requiring remedial reading instruction have higher MAT scores than some individual pupils not considered to require it. Inspection of the percentile data in Table 3-1 provides additional information. Over 90 percent of pupils who were diagnosed as needing remedial reading score

Table 3-1.--Statistics for fifth-grade sample and population from the Anchor Test Study by remedial reading diagnosis: United States, spring, 1972

Statistic	Remedial reading diagnosis			
	Total	Diagnosed Need	No diagnosed need	Not reported
Number of pupils in sample	65,399	5,803	55,377	4,219
Number of schools in sample	845	625	840	517
Estimated number of pupils in population (in thousands)	4,009	367	3,390	252
Percent of estimated number of pupils	100	9.2	84.6	6.3
MAT Total Reading mean	53.6	35.3	56.4	43.4
MAT Total Reading standard deviation	18.2	12.5	17.5	17.9
MAT Total Reading standard error of mean	0.25	0.39	0.26	0.79
Percent of pupils below the 50th percentile	51.0	92.0	45.0	72.0
Standard error below 50th	0.6	0.6	0.6	1.7
Percent of pupils below the 25th percentile	25.0	65.0	19.0	46.0
Standard error below 25th	0.5	1.3	0.5	2.0

below the 50th percentile, and 65 percent score below the 25th percentile. While these statistics indicate that those pupils diagnosed as being in need of reading services score quite low on the average, it is surprising that eight percent of these pupils score above the population median while 19 percent of those not diagnosed as needing special help score below the 25th percentile.

Some of this overlap may be attributed to misclassification of pupils, measurement error in the MAT, diagnosed needs in aspects of reading not measured by the MAT, or improved reading achievement by some diagnosed pupils as a result of services received. On the other hand, the possibility also exists that some segments of the population are being systematically diagnosed as requiring remedial reading either more or less frequently than a criterion such as "lowest quarter of the national norms" would justify. Jencks (1972b) has suggested that one explanation for observed inequality in academic performance is that compensatory services are inequitably distributed throughout the population of school children, that compensatory services are not always provided to those pupils with the greatest "need". This issue will be explored further in later sections of this report.

3.3 Primary Language

Literature assessing the relationship between primary language and reading achievement is sparse. However, the available data demonstrate the kind of relationship we might expect. For example, data analyzed by Stebbins, et al. (1976) as part of the national evaluation of Project Follow Through showed that about five percent of third-grade pupils in the study did not speak English as a first language. The MAT Total Reading mean score for these pupils was about one-half standard deviation below the mean of pupils speaking English as a first language.

Table 3-2 contains selected statistics from fifth-grade pupils in the Anchor Test Study. On the basis of teacher reports, pupils were classified as having English as a primary language, not having English as a primary language but not being handicapped by this fact, or not having English as a primary language and having a learning handicap in reading and other subjects as a result. The great majority of pupils in the population (an estimated 95.8 percent) speak English as a first language. About two percent are estimated to fall in each of the other two categories.

Table 3-2.--Statistics for fifth-grade sample and population from the Anchor Test Study by primary language: United States, spring, 1972

Statistic	Primary language				
	Total	English	Not English, not a handicap	Not English, a handicap	Not reported
Number of pupils in sample	65,399	62,600	724	1,226	849
Number of schools in sample	845	844	134	196	211
Estimated number of pupils in population (in thousands)	4,009	3,842	43	72	52
Percent of estimated number of pupils	100	95.8	1.1	1.8	1.3
MAT Total Reading mean	53.6	54.2	45.4	33.2	40.2
MAT Total Reading standard deviation	18.2	18.1	16.2	12.7	19.3
MAT Total Reading standard error of mean	0.25	0.24	1.19	0.66	1.88
Percent of pupils below the 50th percentile	51.0	50.0	71.0	93.0	65.0
Standard error below 50th	0.6	0.5	3.0	1.1	4.0
Percent of pupils below the 25th percentile	25.0	24.0	40.0	73.0	41.0
Standard error below 25th	0.5	0.5	3.3	2.1	4.7

As one might expect, the estimated MAT Total Reading mean for pupils classified as being handicapped as a result of not speaking English as a first language is quite low (33.2), more than a full standard deviation below the estimated mean of pupils who speak English as a first language (54.2). More than 90 percent of the pupils in the former group score at or below the population median. On the average, pupils classified as not speaking English as a first language and not being handicapped as a result score between pupils in the two other groups (45.4). The fact that they do average one-half standard deviation below pupils with English as a first language is somewhat of a surprise, since they were specifically cited as not having a learning handicap. Two hypotheses can be advanced. First, teachers' classifications of many of the "not English-not a handicap" pupils may have been incorrect. Perhaps some teachers did not fully appreciate the extent to which some pupils are handicapped by virtue of their bilingualism. Second, it is possible that the classification may have been essentially correct. This would suggest that many bilingual pupils may be below average in reading achievement for reasons other than language problems, *per se*, e.g., because of cultural factors, type of school attended, etc.

3.4 Racial/Ethnic Group

The relationship between racial/ethnic group and average performance on standardized achievement tests has been well documented in recent years. Coleman *et al*. (1966) reported that differences in educational outcomes between minority groups and Whites are largest for Blacks and Puerto Ricans, and smallest for Orientals. Similarly, the National Assessment of Educational Progress (NAEP) found that Whites at all age levels studied (9,13,17 and adult) characteristically score above national norms while Blacks score below (NAEP, 1974). In his review of the literature concerning the association between race and achievement, Jencks (1972b) found that White children, on the average, score about one-standard deviation above Black children on both IQ and standardized achievement tests.

Not only have researchers found large variations among the achievement levels of pupils from different racial/ethnic groups, but these differences have persisted even after adjustment for other background characteristics. For example, Mayeske (1970) showed that, beyond available SES and family structure variables, race was associated with an extra five to ten percent of the variation in achievement scores.

Table 3-3 presents selected statistics from fifth-grade pupils who participated in the Anchor Test Study, stratified by five racial/ethnic categories. The majority (an estimated 79.3 percent) of fifth-grade pupils in the population is Caucasian, about 14 percent are Black, five percent are Spanish-surnamed, and less than one percent each are Oriental or American Indian. Large variations in average reading achievement among the different racial/ethnic groups are also apparent in this table. Oriental and Caucasian pupils have the highest estimated means (59.4 and 57.6, respectively), followed by American Indians who average about two-thirds of a standard deviation below the former two groups (44.8). Spanish-surnamed pupils (40.6) score somewhat lower than American Indians, and Blacks score lowest (36.3), more than a full standard deviation below the estimated averages for Orientals and Caucasians.

These findings, although neither new nor unexpected -- given previous research, are truly dramatic. Table 3-3 indicates that, while approximately six out of ten Oriental and Caucasian fifth-graders score above the national average (50th percentile) on the MAT, seven out of every ten pupils of American Indian heritage, eight out of every ten Spanish-surnamed pupils, and nearly nine out of every ten Black pupils (87 percent) are estimated to score below the national average. One begins to appreciate the extent of the underachievement of minority group pupils -- especially Blacks -- when one realizes that the estimated average reading achievement for the entire population of Black fifth-graders (36.3), is comparable to that for pupils who have been specifically diagnosed as needing remedial work in reading (35.3; see Table 3-1) and is only slightly above that for pupils considered to have a learning handicap by virtue of not speaking English as their primary language (33.2; see Table 3-2). The pronounced racial/ethnic group differences in average reading achievement will be discussed further in Chapter Four.

3.5 Reported IQ

So-called intelligence or "IQ" tests have become increasingly controversial in recent years. Some of the more ardent proponents of IQ tests have argued that individuals differ along a general ability-to-learn

Table 3-3.--Statistics for fifth-grade sample and population from the Anchor Test Study by racial/ethnic group: United States, spring, 1972

Statistic	Racial/ethnic group						
	Total	American Indian	Black	Oriental	Spanish surnamed	Caucasian/ other	Not reported
Number of pupils in sample	65,399	381	10,218	439	3,375	50,573	413
Number of schools in sample	845	105	396	160	322	813	98
Estimated number of pupils in population (in thousands)	4,009	27	553	26	199	3,178	27
Percent of estimated number of pupils	100.0	0.7	13.8	0.6	5.0	79.3	0.7
MAT Total Reading mean	53.6	44.8	36.3	59.4	40.6	57.6	44.4
MAT Total Reading standard deviation	18.2	17.6	14.9	17.1	15.9	16.9	19.2
MAT Total Reading standard error of mean	0.25	2.66	0.43	1.26	0.73	0.21	3.16
Percent of pupils below the 50th percentile	51.0	70.0	87.0	37.0	80.0	43.0	68.0
Standard error below 50th	0.6	6.6	0.8	3.3	1.4	0.5	6.4
Percent of pupils below the 25th percentile	25.0	45.0	64.0	16.0	53.0	16.0	45.0
Standard error below 25th	0.5	5.2	1.2	2.5	2.0	0.4	7.0

dimension, that such differences are to a large degree genetically determined, and that IQ test scores reflect such individual differences in innate "intelligence" (e.g., Jensen, 1969). Equally impassioned critics have argued that IQ tests are "racist" or "culturally biased" in that they reflect white middle-class cultural values and socialization practices and are thus inherently discriminatory against members of minority groups (e.g., Kagan, 1969). Critics have also questioned the claim that IQ tests measure "ability" as distinct from "achievement," noting that there is little discernable difference in the content of tests purporting to measure a pupil's "IQ" or "aptitude" and those claiming only to provide a summary index of the pupil's current level of accomplishment in one or more academic subject areas (Bryant et al., 1974).

In the course of Anchor Test Study data collection, fifth-grade teachers were asked to report their pupils' scores on "your most recently administered standardized intelligence test." These data provide some basis for examining two intriguing questions: (a) How widespread was the use of standardized intelligence tests in the American educational system, as of April 1972; in light of the controversy about the validity and meaningfulness of IQ scores, had many schools discontinued routine administration of intelligence tests, or was an "IQ" score still a common element of pupils' academic records? and (b) What is the relationship between "IQ," as measured by whatever tests were then in use, and "reading achievement" as measured by the MAT?

We would caution that the Anchor Test Study findings probably represent lower limit estimates with respect to both of these issues. Thus, insofar as there was any bias in the reporting of available IQ test scores, it most likely was in the direction of underreporting. Individual teachers may not have known that IQ test data were available, may not have wanted to take the time to assemble this information, may have had personal reservations about the propriety of "giving out" such information, or for some other reason may not have reported IQ scores which were in fact available. The second caveat stems from the assumption that schools in the Anchor Test Study probably did not all use the same test to measure IQ. Insofar as the Anchor Test Study IQ data represent a hodge-podge of scores obtained from tests of differing content, administration procedure, scoring system, etc., the estimated IQ-MAT relationship should be less strong than would have been the case if a single IQ test had been used.

Overall Anchor Test Study findings for reported IQ are presented in Table 3-4. Looking first at the population distribution findings, it may be seen that usage of IQ tests in 1972 was indeed widespread. Based upon the reported data, IQ test scores were available for an estimated 74.1 percent of fifth-grade pupils in the nation. This, for reasons discussed above, is probably a minimum estimate. It is interesting to note that 737 of the 845 schools in the Anchor Test Study sample were represented in the "normal" (90-110) IQ range. If one assumes that most schools would have at least one fifth-grade pupil falling in this range, this means that at least 84.5 percent of the schools in the Anchor Test Study sample maintained (and were willing to report) pupil IQ test data.

The sample and population distribution data also indicate that the distribution of reported IQ scores is skewed, with numerically and proportionally more pupils falling in the above average than in the below average categories. Since most IQ tests are structured to produce symmetrical score distributions, this suggests that usage and/or reporting of IQ test data was greater for pupils falling toward the upper end of the "IQ spectrum" than for those at the lower end.

Turning now to the reading achievement data, it may be seen that the relationship between reported IQ and average MAT Total Reading performance is very strong, particularly when one recalls that IQ data were not obtained from any single test. The estimated MAT Total Reading means range from 27.9 for the lowest IQ category (below 75) to 78.4 for the highest category (above 125). Similarly, the estimates of the percent of pupils scoring below the national average on the MAT range from 99 percent at the low end of the IQ dimension to three percent at the high end.

The IQ-MAT relationship described above is nearly as strong as one would expect to find between the MAT and another test of "reading achievement" or between this IQ index and another, independently obtained IQ test. Consistent with these findings, the publishers of the MAT report correlations above .80 between the MAT and group-administered IQ tests (Harcourt, Brace, Jovanovich, 1971).

One's interpretation of these findings obviously depends upon one's views about intelligence tests. If one begins with the premise that IQ tests measure individual differences in innate intellectual ability, one would have to conclude that reading achievement at the fifth-grade

Table 3-4.--Statistics for fifth-grade sample and population from the Anchor Test Study by reported IQ: United States, spring, 1972

Statistic	Reported IQ						
	Total	Below 75	75-89	90-110	111-125	Above 125	Not reported
Number of pupils in sample	65,399	1,478	7,217	23,905	12,408	3,414	16,977
Number of schools	845	337	663	737	705	577	731
Estimated number of pupils in population (in thousands)	4,009	86	433	1,471	769	209	1,040
Percent of estimated number of pupils	100	2.1	10.8	36.7	19.2	5.2	25.9
MAT Total Reading mean	53.6	27.9	36.0	52.3	68.4	78.4	49.0
MAT Total Reading standard deviation	18.2	9.7	12.2	14.5	12.5	10.6	19.0
MAT Total Reading standard error of mean	0.25	0.34	0.26	0.22	0.20	0.28	0.54
Percent of pupils below the 50th percentile	51.0	99.0	92.0	55.0	14.0	3.0	61.0
Standard error below 50th	0.6	0.3	0.5	0.6	0.5	0.4	1.1
Percent of pupils below the 25th percentile	25.0	88.0	63.0	19.0	2.0	1.0	35.0
Standard error below 25th	0.5	1.1	0.9	0.5	0.2	0.2	1.3

level -- as measured by the MAT -- is almost entirely a result of the individuals' innate intelligence and that any other factors which might be thought to affect such achievement are essentially insignificant. If one begins with the view that the meaning of IQ test scores is an open question, one would be tempted to propose that the IQ tests which were administered to fifth-grade pupils across the nation in 1972 actually measured little -- if anything -- more than the pupils' reading achievement. Another way of saying this is that IQ tests do not explain a pupil's reading achievement; they simply measure it.

However interpreted, the [illegible] strong relationship between reported IQ and average MAT reading achievement would seem to justify at least one practical admonition to parents, teachers, and school administrators: think twice before drawing any conclusions from a fifth-grader's IQ test score that you would not make on the basis of a reading achievement test score.

3.6 Summary of Findings

In this chapter the univariate relationships of four pupil characteristics (remedial reading diagnosis, primary language, racial/ethnic group, and reported IQ) with reading achievement were examined. The findings are consistent with previously conducted research and with expectations. All four variables were found to be strongly related to reading achievement. The major findings were as follows:

- Remedial reading diagnosis: Pupils diagnosed as needing remedial reading services had a substantially lower estimated MAT Total Reading mean (35.3) than pupils not diagnosed as needing such instruction (56.4).
- Primary language: Pupils classified as being educationally handicapped as a result of not speaking English as a first language had a much lower estimated MAT mean (33.2) than pupils classified as speaking English as a first language (54.2).
- Racial/ethnic group: Oriental and Caucasian pupils had higher estimated MAT Total Reading means (59.4 and 57.6, respectively) than American Indian, Spanish-surnamed or Black pupils (44.8, 40.6, and 36.3, respectively).
- Reported IQ: A strong positive relationship was observed between reported IQ and estimated MAT Total Reading means, the

estimate for pupils in the over-125 reported IQ range being highest (78.4) and the estimate for pupils in the below-75 reported IQ range being lowest (27.9).

None of these findings conflict with previous research. However, there are some surprising findings in the data. First, the magnitude of the differences between estimated MAT means of certain groups of pupils is substantial. *More than a full standard deviation* separates the estimated MAT means of the highest scoring from the lowest scoring groups of pupils for each of the four pupil characteristics listed above. Second, eight percent of those pupils diagnosed as being in need of remedial reading services scored *above* the 50th percentile, while 19 percent of those pupils not diagnosed as needing such services scored *below* the 25th percentile. This indicates that there is an overlap in the distributions of reading scores for these two sets of pupils, perhaps as a result of misclassification of pupils, different criteria for classification, or inequitable distribution of remedial reading services. In the next chapter, inspection of selected two- and three-way relationships of pupil racial/ethnic group and other pupil and school characteristics to reading achievement will qualify these findings to a certain extent.

4.0 FURTHER EXPLORATION OF PUPIL RACIAL/ETHNIC GROUP AND READING ACHIEVEMENT

In this chapter we examine selected two- and three-way relationships between pupil racial/ethnic group and a variety of other variables, including primary language, reported IQ, school SEL, school control, remedial reading diagnosis, and grade-five percent minority, in an effort to gain some additional understanding of factors associated with racial/ethnic differences in reading achievement. For purposes of this chapter we focus on the three largest racial/ethnic groups, Caucasians, Blacks and Spanish-surnamed pupils. The sample sizes for other groups are too small to permit further subclassifications.

4.1 Pupil Racial/Ethnic Group and Primary Language

In Section 3.3, it was noted that pupils who do not speak English as their primary language tend to obtain lower scores on the MAT Total Reading scale than pupils whose primary language is English. Table 4-1 examines the association between primary language and racial/ethnic group. It may be seen that the great majority of pupils whose primary language is not English are Spanish-surnamed: of the estimated 115,000 bilingual fifth-graders, an estimated 96,000 (82.6 percent) are Spanish-surnamed. Table 4-1 also indicates that nearly half of all Spanish-surnamed fifth-graders (47.8 percent) do not speak English as their primary language and, of those, a substantial proportion are considered to have a learning handicap by virtue of their language problem (61,000/95,000 = 64.2 percent).

The data presented in Table 4-1 support two additional conclusions. First, at least for Spanish-surnamed pupils, teacher assessments of whether of not a pupil is "handicapped" in reading by virtue of not speaking English as his/her primary language appear to have been valid: the estimated mean for bilingual Spanish-surnamed pupils not considered to have a learning handicap (44.4) is essentially identical to that for Spanish-surnamed pupils who speak English as their primary language (45.0) and is substantially higher than that for Spanish-surnamed pupils who are considered to have a language-related handicap in reading (31.8). Second. language problems among Spanish-surnamed pupils account for some, but by no means all of the overall difference in average reading achievement between Spanish-surnamed and Caucasian pupils: the estimated means for Spanish-surnamed pupils who

Table 4-1. -- Estimated number and percent of pupils and estimated MAT Total Reading mean, by racial/ethnic group of pupil and by primary language of pupil: Grade 5, United States, Spring 1972.

Primary language of pupil	Racial/ethnic group of pupil											
	Total**			Black			Spanish-surnamed			Caucasian		
	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean
	Number‡	Percent		Number‡	Percent		Number‡	Percent		Number‡	Percent	
Total	4,009	100.0	53.6	553	100.0	36.3	199	100.0	40.6	3,178	100.0	57.6
English	3,842	95.8	54.2	545	98.6	36.3	97	48.7	45.0	3,144	98.9	57.6
Not English-not considered handicapped	43	1.1	45.4	2	0.4	31.5	34	17.1	44.4	6	0.2	52.7
Not English-considered handicapped	72	1.8	33.1	1	0.2	30.4	61	30.7	31.8	7	0.2	43.6
Not reported	52	1.3	46.2	5	0.9	33.2	6	3.0	35.9	21	0.7	56.5

‡ Estimated number in thousands.
** Includes all racial/ethnic groups.

do not have a language-related handicap (44-45) are considerably below the overall average reading score of Caucasian pupils (57.6). This suggests that cultural and socioeconomic factors, in addition to language problems, may play important roles in accounting for the overall underachievement of Spanish-surnamed pupils relative to Caucasian pupils.

4.2 Pupil Racial/Ethnic Group and Reported IQ

Table 4-2 presents statistics from the Anchor Test Study for each pupil racial/ethnic group by reported IQ range. A strong relationship between reported IQ and reading achievement is observed within each of the racial/ethnic categories. Overall, IQ was not reported for 25.9 percent of all pupils in the Anchor Test Study sample. Nonreport of IQ appears to be associated with race, since only 21.6 percent of Caucasian pupils have no reported IQ while data were not reported for 42.5 percent of Black and 39.7 percent of Spanish-surnamed pupils. This selective unavailability and/or nonreporting of the IQ data may be related to the perception of many educators, especially the School Coordinators who collected the Anchor Test Study data, that IQ tests are not valid measures of the intellectual ability of minority pupils.

Table 4-2 shows that pupil racial/ethnic group has the same basic relationship with reported IQ that it does with the MAT itself. Thus, Black and Spanish-surnamed pupils are substantially overrepresented in comparison to Caucasians in the "below average" IQ categories (i.e., less than 90), as they were in the "below the 25th percentile" category of the MAT. These distribution findings clearly reflect the strong relationship between MAT and IQ test scores noted earlier in Section 3.5.

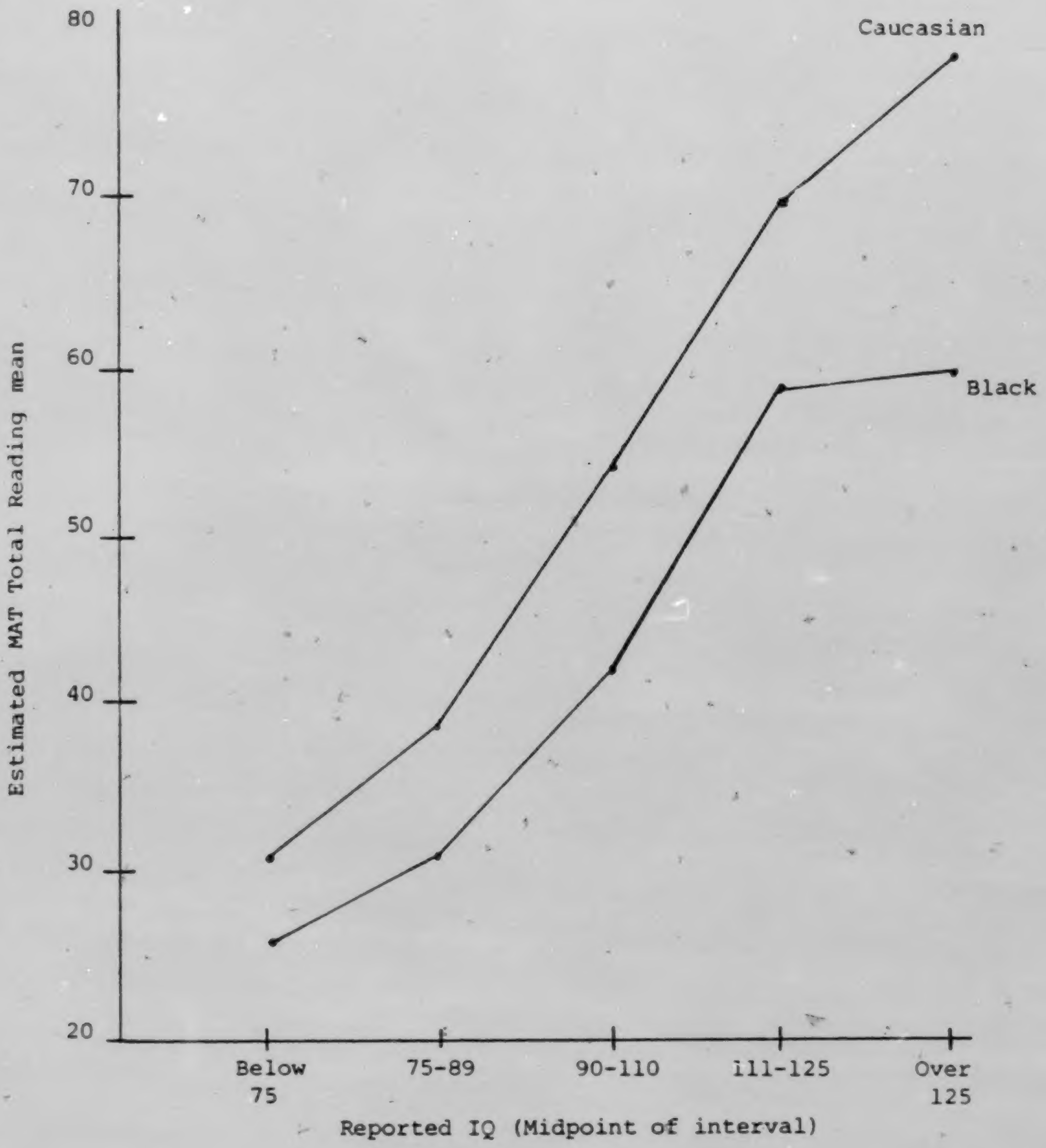
Figure 4.1 graphically illustrates the IQ-MAT relationship, separately for Black and Caucasian pupils. It may be seen that, for IQ ranges up to 125, the two curves basically parallel one another, with the Black estimated MAT means being about 10 points below those for Caucasians (except in the below 75 IQ category, where the difference is only about five points). Going from the 111-125 IQ range to the over-125 category, Figure 4.1 indicates that the curve for Caucasians continues to increase, while that for Blacks levels off, with the result that the estimated mean for Black pupils is 19 points below that for Caucasian pupils in the above-125 IQ category.

Table 4-2. -- Estimated number and percent of pupils and estimated MAT Total Reading mean, by racial/ethnic group of pupil and by reported IQ of pupil: Grade 5, United States, Spring 1972.

Reported IQ of pupil	Racial/ethnic group of pupil											
	Total**			Black			Spanish-surnamed			Caucasian		
	Grade 5 Pupils		Total Reading mean	Grade 5 Pupils		Total Reading mean	Grade 5 Pupils		Total Reading mean	Grade 5 Pupils		Total Reading mean
	Number‡	Percent+		Number‡	Percent+		Number‡	Percent+		Number‡	Percent+	
Total	4,009	100.0	53.6	553	100.0	36.3	199	100.0	40.6	3,178	100.0	57.6
Not reported	1,040	25.9	49.0	235	42.5	35.2	79	39.7	37.6	686	21.6	55.3
Reported												
Total	2,969	74.1	55.2	318	57.5	37.1	120	60.3	42.6	2,492	78.4	58.2
Below 75	86	(2.9)	27.9	41	(12.9)	25.5	8	(6.7)	27.8	36	(1.4)	30.6
75-89	433	(14.6)	36.0	115	(36.2)	30.8	37	(30.8)	33.3	274	(11.0)	38.6
90-110	1,471	(49.5)	52.3	139	(43.7)	41.9	61	(50.8)	45.7	1,254	(50.3)	53.8
111-125	769	(25.9)	68.4	21	(6.6)	58.8	12	(10.0)	62.6	726	(29.1)	68.8
Over 125	209	(7.0)	78.4	3	(0.9)	59.7	1*	(0.8)*	69.0*	201	(8.1)	78.7

‡ Estimated number in thousands.
* Estimate based upon sample of less than 25 schools.
** Includes all racial/ethnic groups.
+ Parentheses indicate estimated percent of pupils with reported IQ test scores.

Figure 4-1.--Estimated MAT Total Reading mean by reported IQ for Black and Caucasian pupils



One argument for continuing to use IQ tests in schools is that they are useful in identifying "underachievers," students whose performance in specific subject areas is lower than would be expected on the basis of their overall level of current intellectual accomplishment (as assessed by IQ tests) and who thus may need special help or attention in those subjects (e.g., Wardrop, 1976). Viewed from that perspective, the findings described above suggest that at all IQ levels and particularly at the high end of the IQ dimension, Black pupils are "underachieving" in reading relative to the Caucasian (or, almost equivalently, to the overall national) norm.

4.3 Pupil Racial/Ethnic Group and School Socioeconomic Level

A possible explanation for differences in performance between Caucasian and minority group pupils reported in previous sections may be differences in the socioeconomic status of individuals or of the schools they attend. Table 4-3 presents statistics from the Anchor Test Study by pupil racial/ethnic group and school socioeconomic level (SEL).

The majority of Black pupils (60.0 percent) are enrolled in low-SEL schools, with only 35.3 percent in middle-SEL schools and 4.7 percent in high-SEL schools. Spanish-surnamed pupils are about equally divided between low and middle-SEL schools (44.7 and 49.1 percent). By contrast, only 15.6 percent of Caucasian pupils are enrolled in low-SEL schools.

Large differences are observed in estimated MAT Total Reading means over SEL categories within each racial/ethnic group. Within SEL categories, however, there are still large differences between racial/ethnic groups. The estimated MAT Total Reading mean for Black pupils attending high-SEL schools is 42.6, 9.2 points lower than the mean of 51.8 for Caucasians attending low-SEL schools. Table 4-4 presents estimated MAT means for the various racial/ethnic groups adjusted for differences in SEL. The difference between Black and Caucasian pupils is reduced somewhat by the adjustment (from 21.3 to 18.2) but remains large. We conclude that school SEL (as recorded in this study) has but a small relation to the difference in performance between pupils of different racial/ethnic groups. One possible explanation for this rather surprising finding is that the Anchor Test Study school SEL measure may be a poor proxy for the kinds of pupil-level SES measures used in other research and, hence, is simply not adequate for controlling SES factors when studying racial/ethnic differences in achievement.

Table 4-3. -- Estimated number and percent of pupils and estimated MAT Total Reading mean, by racial/ethnic group of pupil and by socioeconomic level of school: Grade 5, United States, Spring 1972.

Socioeconomic level of school	Racial/ethnic group of pupil											
	Total**			Black			Spanish-surnamed			Caucasian		
	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean
	Number‡	Percent		Number‡	Percent		Number‡	Percent		Number‡	Percent	
Total	4,009	100.0	53.6	553	100.0	36.3	199	100.0	40.6	3,178	100.0	57.6
High	909	22.7	61.6	26	4.7	42.6	12	6.0	50.7	856	26.9	62.4
Middle	2,155	53.8	54.5	195	35.3	39.2	98	49.2	41.5	1,825	57.4	56.8
Low	946	23.6	43.9	332	60.0	34.0	89	44.7	38.1	497	15.6	51.8

‡ Estimated number in thousands

** Includes all racial/ethnic groups.

Table 4-4.--Estimated MAT Total Reading mean and estimated MAT Total Reading mean adjusted for school SEL, by pupil racial/ethnic group: Grade 5, United States, spring, 1972

Statistic	Racial/Ethnic Group					
	American Indian	Black	Oriental	Spanish-Surnamed	Caucasian/Other	Group not reported
Raw mean	44.8	36.3	59.4	40.6	57.6	44.4
Adjusted mean	46.0	38.7	58.9	42.8	56.9	50.5
Difference	+1.2	+2.4	-0.5	+2.2	-0.7	+6.1

4.4 Pupil Racial/Ethnic Group and School Control

In an earlier discussion of school control (Section 2.3) it was reported that approximately 90 percent of all fifth-grade pupils attend public schools and that there was a large univariate difference between the estimated MAT Total Reading means of public and nonpublic school pupils, although the reasons for this difference are unclear. Table 4-5 presents statistics from the Anchor Test Study by pupil racial/ethnic group and school control.

While an estimated 9.6 percent of all pupils attend nonpublic schools, the percentages for Black (5.4 percent) and Spanish-surnamed (6.5 percent) pupils in nonpublic schools are lower than the percentage of Caucasians (10.6 percent). The achievement difference between public and nonpublic school pupils is larger for Black (16.1 points) and Spanish-surnamed (8.4 points) pupils than for Caucasians (5.9 points). The small number of minority pupils attending nonpublic schools prohibits further investigation of this interaction. The possibility exists that if the instructional or social characteristics of nonpublic schools were responsible for the observed differences (rather than selection bias on the part of parents and schools), then the benefits of attending nonpublic schools may be greater for minority than for Caucasian pupils. However, the selection bias explanation cannot be ruled out.

4.5 Pupil Racial/Ethnic Group and Remedial Reading Diagnosis

In Section 3.2, a large difference in reading achievement between pupils diagnosed as needing remedial reading instruction and those not so diagnosed was reported. Table 4-6 contains statistics from the Anchor Test Study by remedial reading diagnosis and racial/ethnic group.

Jencks (1972b) has suggested that compensatory services (which would include remedial reading) are distributed unequally among the population: that low income and minority pupils are less likely to receive such services than White or more affluent pupils. While the "remedial reading" variable used in the Anchor Test Study measures diagnosis of a need for remedial services rather than receipt of such services (that is, some pupils diagnosed as needing services may not actually get them), it may serve as a proxy variable to partially investigate Jencks' assertion. From Table 4-6 we note that 7.8 percent of Caucasian pupils are diagnosed as requiring remedial reading instruction while 14.6 percent of Black pupils

Table 4-5. -- Estimated number and percent of pupils and estimated MAT Total Reading mean, by racial/ethnic group of pupil and by control of school: Grade 5, United States, Spring 1972.

Control of school	Racial/ethnic group of pupil											
	Total**			Black			Spanish-surnamed			Caucasian		
	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean
	Number‡	Percent		Number‡	Percent		Number‡	Percent		Number‡	Percent	
Total	4,009	100.0	53.6	553	100.0	36.3	199	100.0	40.6	3,178	100.0	57.6
Public	3,623	90.4	52.8	523	94.6	35.4	186	93.5	40.0	2,842	89.4	56.9
Nonpublic	386	9.6	61.4	30	5.4	51.5	13	6.5	48.4	336	10.6	62.8

‡ Estimated number in thousands.

** Includes all racial/ethnic groups.

Table 4-6. -- Estimated number and percent of pupils and estimated MAT Total Reading mean, by racial/ethnic group of pupil and by remedial reading diagnosis for pupil: Grade 5, United States, Spring 1972.

Remedial reading diagnosis for pupil	Racial/ethnic group of pupil											
	Total**			Black			Spanish-surnamed			Caucasian		
	Grade 5 pupils		Total reading mean	Grade 5 pupils		Total reading mean	Grade 5 pupils		Total reading mean	Grade 5 pupils		Total reading mean
	Number*	Percent		Number*	Percent		Number*	Percent		Number*	Percent	
Total	4,009	100.0	53.6	553	100.0	36.3	199	100.0	40.6	3,178	100.0	57.6
Diagnosed need	367	9.2	35.3	81	14.6	28.7	31	15.6	31.6	249	7.8	38.0
No diagnosed need	3,390	84.6	56.4	417	75.4	38.4	150	75.4	43.0	2,771	87.2	59.8
Not reported	252	6.2	43,4	55	9.9	31.2	17	8.5	35.2	157	4.9	48.8

* Estimated number in thousands.
** Includes all racial/ethnic groups.

and 15.6 percent of Spanish-surnamed pupils are similarly diagnosed. However, the mean achievement of these two minority groups is lower than that of Caucasians, so it is expected that a greater proportion of pupils would be in need of remedial services. The critical question is: "Is the probability of a pupils being diagnosed as needing remedial reading, given a similar level of performance on the MAT, the same for pupils of different racial/ ethnic groups?"

Several indicators of need for remedial reading exist in the Anchor Test Study data base: the diagnosis discussed here; the recognition that a pupil is handicapped because English is not his or her primarly language (see Section 3.3); and the proportion of pupils below the 25th percentile on the MAT. Table 4-7 contains data relevant to these three variables for Black, Spanish-surnamed and Caucasian pupils and, in addition, shows a "service" index of the relationship between remedial reading diagnosis and MAT Total Reading score ranges. This index is computed by dividing the percentage of pupils diagnosed as requiring remedial reading by the percentage of pupils scoring below the 25th percentile on the MAT.* While the percentage of Caucasian pupils diagnosed as needing remedial reading is about half the percentage for Black and Spanish-surnamed pupils, the percentage of Caucasian pupils below the 25th percentile is only about one fourth that of the other two groups. Consequently, the service index shows that as a fraction of pupils scoring below the 25th percentile, the percent of minority pupils diagnosed as requiring remedial reading instruction is only half that for Caucasian pupils. We also see that 30.7 percent of all Spanish-surnamed pupils are considered by their teachers to have a learning handicap in reading because their primary language is not English. Yet only half that number, 15.6 percent of all Spanish-surnamed pupils, are reported to have been diagnosed as needing remedial reading services.

Another bit of evidence about possible disparities between Caucasian and minority pupils in access to remedial instruction is the difference in estimated MAT means shown in Table 4-6. The estimated mean score for Black pupils diagnosed as needing remedial reading is 28.7, that for Spanish-surnamed

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* Since not all pupils diagnosed as needing remedial help in reading score below the 25th percentile, this index provides an upper limit estimate of the percent of pupils with MAT Total Reading scores below the 25th percentile who have been diagnosed as needing remedial reading services.

Table 4-7.--Indicators of need for remedial reading services, by racial/ethnic group: Grade 5, United States, Spring, 1972

Indicator	Racial/Ethnic Group		
	Caucasian/ Other	Black	Spanish- Surnamed
Percent of pupils diagnosed as needing remedial reading	7.8	14.6	15.6
Percent of pupils at or below 25th percentile of MAT	16.0	64.0	53.0
Pupils diagnosed as needing remedial reading as a percent of pupils at or below 25th percentile*	48.8	22.8	29.4
Percent of pupils handicapped because their primary language is not English	0.2	0.2	30.7

*Computed by dividing item A (percent of pupils diagnosed as needing remedial reading) by item B (percent of pupils at or below the 25th percentile).

pupils is 31.6. However, the estimate for Caucasian pupils so diagnosed is substantially higher (38.0), and is nearly identical to the mean for Black pupils not diagnosed as requiring remediation (38.4). Given this pattern, we conclude that the rate at which Black and Spanish-surnamed pupils are diagnosed as needing remedial help in reading (which, presumably, is a first step in a sequence of events leading to receipt of such help) is lower than would be expected on the basis of MAT performance and perhaps lower than is equitable.

4.6 Pupil Racial/Ethnic Group and Grade-Five Percent Minority

The concentration of minority pupils in certain schools has long been a controversial topic. Many opponents of desegregation have cited data (such as that described in Section 2.5) showing a negative association between the minority enrollment of a school and the achievement of its students. In Section 2.6.6 it was reported that school SEL could account for only part of the observed univariate differences in achievement among percent minority categories. Here we will explore the relationship of percent minority and the racial/ethnic characteristics of individual pupils.

Table 4-8 contains statistics from the Anchor Test Study of racial/ethnic groups and grade-five percent minority. The estimated means for certain major groups are also presented graphically in Figure 4-2. Within each racial/ethnic group, the negative relationship between percent minority and achievement is observed. We note that the trend for Spanish-surnamed pupils is very similar to that for Caucasian pupils. Unfortunately it was not statistically possible to remove the effect of SEL from these curves (via the means adjustment technique) because of the fact that certain cells contained too few cases to provide reliable means. Specifically, there were very few Blacks and Spanish-surnamed pupils attending High SEL schools where percent minority was above 10 percent.

Table 4-9 shows the univariate means for different percent minority categories adjusted for school SEL (as shown in Table 2-14), for pupil racial/ethnic group, and for both together. We see that when adjusted for the joint effect of school SEL and pupil race/ethnicity, the difference between the 11-35 percent and the 36-100 percent minority enrollment categories virtually disappears and the difference between these two categories and the 1-10 percent category is reduced to approximately four points (compared to the 18-point difference between the 1-10 percent and 36-100 percent categories before adjustment). Figure 4-3 portrays the raw and adjusted means presented in Table 4-9.

Figure 4-2.--Estimated MAT Total Reading mean by percent minority for Caucasian, Spanish-surnamed and Black pupils

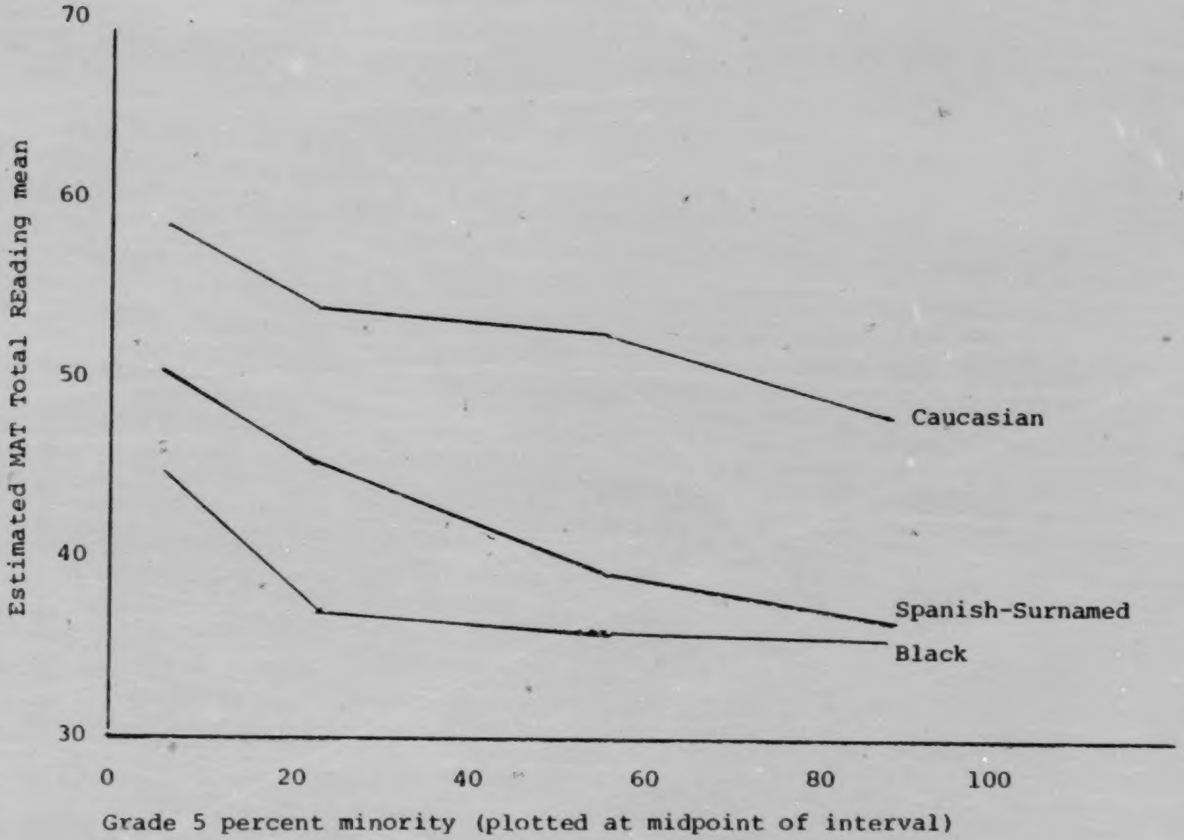


Table 4-8.--Estimated Number of Pupils (in Thousands) and MAT Total Reading Mean, by Grade 5 Percent Minority of School and by Racial/Ethnic Group of Pupil: Grade 5, United States, Spring 1972

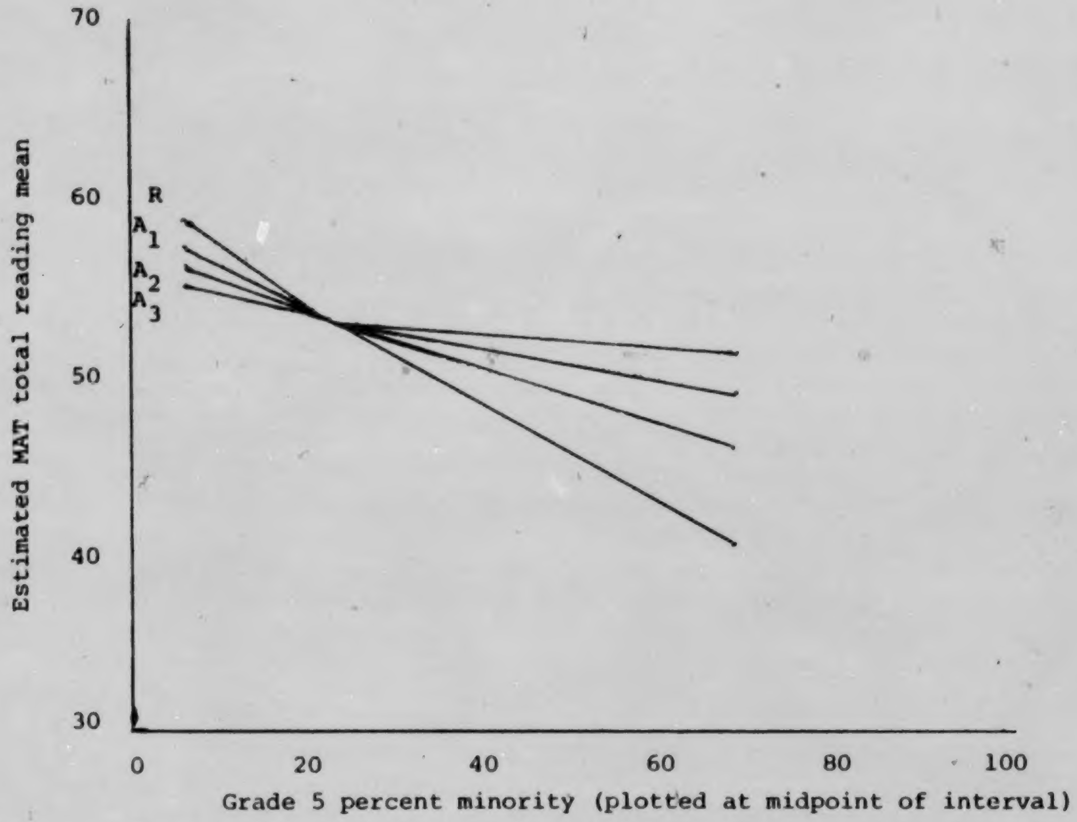
Racial/Ethnic Group	Grade 5 Percent Minority											
	Total		0		1-10		11-35		36-75		76-100	
	Estimated No. of Pupils in Population (in thousands)	MAT Total Reading Mean	Estimated No. of Pupils in Population (in thousands)	MAT Total Reading Mean	Estimated No. of Pupils in Population (in thousands)	MAT Total Reading Mean	Estimated No. of Pupils in Population (in thousands)	MAT Total Reading Mean	Estimated No. of Pupils in Population (in thousands)	MAT Total Reading Mean	Estimated No. of Pupils in Population (in thousands)	MAT Total Reading Mean
Total	4,009	53.6	891	58.7	1,514	58.6	792	51.7	354	45.5	458	36.3
American Indian	27	44.8	**	**	5	50.8	10	40.7	5*	53.3*	7*	40.4*
Black	553	36.3	**	**	22	44.6	95	37.3	114	35.8	322	35.6
Oriental	26	59.4	**	**	5	65.1	6	56.1	10*	58.7*	5*	58.5*
Spanish-Surnamed	199	40.6	**	**	19	50.5	45	45.6	53	39.3	83	36.5
Caucasian/Other	3,178	57.6	891	58.7	1,456	58.9	630	54.4	171	52.8	30	48.3
Not Reported	27	44.4	**	**	7	49.7	7	54.9	2*	53.5*	10*	31.7*

*Estimate based upon sample of less than 25 schools.
**Sample contains no pupils in this category.

Table 4-9.--Estimated MAT Total Reading mean and estimated MAT Total Reading mean adjusted for socioeconomic level, for pupil racial/ethnic group, and for both SEL and pupil racial/ethnic group, by grade-five percent minority: Grade 5, United States, spring, 1972

	Grade-five percent minority			
	0	1-10	11-35	36-100
Raw mean	58.7	58.6	51.7	40.6
Mean adjusted for SEL	58.4	57.1	52.0	45.9
Difference	-0.3	-1.5	+0.3	+5.3
Mean adjusted for pupil race	--	56.5	51.6	49.0
Difference	--	-2.1	-0.1	+8.4
Mean adjusted for both SEL and race	--	55.4	51.9	51.2
Difference	--	-3.2	+0.2	+10.6

Figure 4-3.--Raw and adjusted estimated MAT Total Reading means, by percent minority



Key:

R = Raw mean

A_1 = Mean adjusted for school SEL only

A_2 = Mean adjusted for pupil racial/ethnic group only

A_3 = Mean adjusted for both school SEL and pupil racial/ethnic group

In Section 2.6.6, we reported that school SEL accounted for only part of the observed mean differences in reading achievement among percent minority categories. The adjustment for pupil racial/ethnic group shown in Table 4-9 accounted for a somewhat larger amount of the difference. Finally, the adjustment for both SEL and pupil race reduced the univariate percent minority mean differences considerably. This indicates that the observed negative relationship between minority enrollment and reading achievement is, to a large extent, a reflection of the relationships among percent minority, school SEL and pupil racial/ethnic group. However, even after adjusting for both race and SEL, there is still a slight tendency for reading achievement to be negatively associated with percent minority enrollment.

4.7 Summary of Findings

In this chapter the relationships of reading achievement to pupil racial/ethnic group and other pupil and school characteristics were examined. The findings qualify to some extent the results of Chapter Three.

The univariate relationship between primary language and reading achievement is maintained within each racial/ethnic group. As we might expect, most pupils who are classified as having a learning handicap as a result of bilinguality are Spanish-surnamed, and these pupils score lower on the average (31.8) than Spanish-surnamed pupils who are classified as being not handicapped because of bilinguality (44.4) or who are classified as having English as their primary language (45.0). However, the latter groups still score lower than Caucasian pupils (57.6).

The relationship between reading achievement and reported IQ differs somewhat across racial/ethnic groups. The reading-IQ relationship is strong and positive for Caucasians, but for Blacks, the relationship shows a pronounced ceiling effect for pupils with IQs over 110 (see Figure 4-1). Several possible explanations for this phenomenon come to mind, including: inadequacy of the data (scores in the highest IQ range were reported for very few Blacks); misclassification of high IQ Black pupils; and the probable enrollment of high ability Black pupils in schools containing high proportions of low achieving pupils. In the latter case, the classroom teacher may devote the most attention to low ability pupils--leaving the high ability Blacks without sufficient instruction.

Further investigation of the relationship between achievement and race revealed that adjusting for differences in school SEL removed only a small portion (3.1 points or about 15 percent) of the mean achievement difference between Blacks and Caucasians. That is, the SEL of schools, as established in this study, has only a small effect on the differences in reading achievement among pupils of different racial/ethnic groups.

Inspection of the relationship of school control and racial/ethnic group to reading achievement provides another interesting observation: While the public/nonpublic difference exists for all racial/ethnic groups, it is largest for Blacks and smallest for Caucasians. This suggests that if the instruction received (and not selection bias) is responsible for the superior achievement of pupils attending nonpublic schools, the benefits of attending such schools are greater for minority pupils than for Caucasians.

Two further observations on the relationship of racial/ethnic group to reading achievement need to be made. First, it has been suggested (Jencks, 1972b) that compensatory services are unequally distributed, and that White and affluent pupils receive more services in relation to their needs than low income and minority pupils. The Anchor Test Study data appear to support this hypothesis, since the average achievement level of White pupils who are diagnosed as needing remedial reading services is almost the same as the achievement level of Black pupils who are not diagnosed as needing such instruction. In addition, about twice as many Caucasian pupils in the lowest quarter of the MAT norms are considered to need remedial services as Black or Spanish-surnamed pupils in the same quarter (see Table 4-7). It appears that different standards are being applied for diagnosing need for remedial reading among White and non-White pupils.

It is possible to greatly reduce the achievement differences between pupils attending schools of different percent minority enrollments by adjusting for both school SEL and racial/ethnic group. This suggests that the observed negative relationship between minority enrollment and reading achievement is in large part due to the relationships among reading achievement, school SEL and pupil racial/ethnic group. We must point out, however, that while these adjustments have reduced the reading achievement differences among pupils in schools of varied percent minority enrollments by about 77 percent, there still is a 4.2 point difference in average reading achievement between pupils who attend schools with 1-10 percent minority enrollment and pupils attending schools of 36-100 percent minority enrollment. The evidence points to a measurable decline in achievement test scores with increasing minority enrollment that does not disappear with the type of school SEL adjustments that were made in this study.

5.0 CLASSROOM CHARACTERISTICS AND READING ACHIEVEMENT

This chapter explores the relationships between reading achievement and two classroom characteristics: ability grouping and class size. These two classroom variables have received considerable attention in the research literature. However, previous investigations have failed to produce consistent results and have been generally inconclusive. Among educators, uncertainty persists about the true relationship of class size or ability grouping to student achievement. Because these two variables are to some extent under the control of school administrators, they have considerable policy importance and warrant additional investigation through the Anchor Test Study data base. Section 5.1 examines the relationship of ability grouping to achievement, while Section 5.2 addresses class size.

5.1 Ability Grouping

5.1.1 Previous Research

The practice of ability grouping and studies of its effects on achievement have been reported in the educational literature since the 1920s. Broadly defined, ability grouping is the organization of instructional classes for a certain grade level or subject matter in which all students exhibit approximately the same level of ability. In elementary grades, ability grouping generally may apply to all subjects, since pupils are often taught as intact classes throughout the school day.

The primary rationale for ability grouping is that is is easier and more effective to tailor the level of difficulty of instruction to the ability level of a class. Homogeneous grouping on the basis of ability makes it possible for a teacher to direct instruction or activities at the performance level of more pupils. The psychological foundations for the practice are found in the aptitude-treatment interaction (ATI) research literature (e.g., Berliner and Cahen, 1973; Tobias, 1976).

Over the past 50 years, hundreds of studies of the effects of ability grouping on achievement have been performed. The results of this research have varied. In 1968 the National Education Association (NEA) conducted a comprehensive review of the research on ability grouping and selected 50 of the most methodologically sound recent reports (NEA, 1968a). NEA differentiated results of the studies reviewed by student ability level and by the direction of findings: favorable to ability grouping, mixed effects, and unfavorable or insignificant effects. Table 5-1 presents their summary findings. Other major reviews of the literature (Goldberg, Passow and Justman, 1966; Esposito, 1973) have reached similar conclusions. In short, the research on ability grouping is inconclusive. Although small effects favoring high ability students (often in "enriched" curricula) have sometimes been reported, these have been offset by unfavorable findings for low ability students, and many studies have found no relationship between ability grouping and achievement (Esposito, 1973).

When faced with a lack of conclusive evidence of beneficial academic effects, proponents of ability grouping have often responded that the practice has significant non-cognitive benefits. Ability grouping has been said to reduce pupil anxiety and to improve the quality of social interactions among classmates. However, in schools containing students from widely different ethnic and economic backgrounds, ability grouping can have the effect of segregating students, since minority and poor children often have low measured ability. The National Opinion Research Center (NORC), in evaluating schools involved in the Emergency School Assistance Program (ESAP) in 1971, found that fifth-grade pupils in ability grouped classrooms did no better or worse than pupils in non-grouped classrooms in terms of achievement, but that their racial attitudes were significantly more negative (NORC, 1973). Other reviews of the literature have reported similar findings (Esposito, 1973; Jencks, 1972b).

The NORC study cited above recommended that ability grouping be permitted in ESAP high schools, notwithstanding ESAP regulations to the contrary and the negative findings of the evaluation. The reason given for the recommendation was the apparent prevalence of the practice. Likewise, Esposito (1973, p. 164) describes ability grouping as "a predominant method of organizing teachers and students into instructional units." NEA (1968b) conducted a survey to which 27 percent of all elementary schools reported

Table 5-1.--Results of studies of effects of ability grouping on achievement

Ability level of students	Effects		
	Favorable	Mixed	Unfavorable or insignificant
Talented	18	11	17
Average	11	12	10
Slow	12	10	17

Source: NEA (1968)

they grouped all pupils, 45 percent grouped some pupils, 25 percent used "random" grouping while the remaining schools did not report. Teachers and principals are also reported to favor the practice (Coleman, 1966; NEA, 1968b).

5.1.2 Findings from Anchor Test Study Data

Table 5-2 contains selected statistics from the Anchor Test Study for fifth-grade pupils by type of ability grouping. We observe that 18.8 percent of all fifth-grade pupils are enrolled in ability grouped classes; 81.2 percent are in heterogeneously grouped classes. This number is considerably smaller than the frequency of ability grouping reported at the school level by NEA (1968b), suggesting that the practice may have become less common in the interval between that study (1967) and the Anchor Test data collection (spring of 1972).

The mean MAT Total Reading score for pupils who were not grouped is 54.0, compared to a total population mean of 53.6. The weighted average of the reading score means for the three categories of ability grouped students is approximately 51.8. This difference of 2.2 points between grouped and not grouped students is statistically significant, but relatively small, given that the standard deviation of the MAT Total Reading score is 18.2. We may conclude that, at a univariate level, nongrouped pupils have a higher mean reading score than do grouped pupils, although this difference is slight. Further examination of the data in Section 5.1.3 will consider other variables which may contribute to the observed difference.

Within the three grouping categories, differences in achievement are quite large, in the neighborhood of 12 to 13 points between categories. The nongrouped pupils, like the "average" grouped pupils, score near the population mean. Since groupings were presumably made on the basis of measured ability, these observations are hardly surprising. However, inspection of the standard deviations and proportions of pupils at or below the 50th percentile suggests that the assignment of students to groups is not without error. The standard deviations of the groups range from 15.5 to 17.3, not much lower than the overall population standard deviation of 18.2. Thus, ability grouped classes are not greatly more homogeneous than the overall

Table 5-2.--Statistics for fifth-grade sample and population from the Anchor Test Study by classroom ability grouping: United States, spring, 1972

Statistic	Classroom ability grouping				
	Total	Not ability grouped	Above Average	Average	Below average
Number of pupils in sample	65,399	52,131	3,172	5,883	4,262
Number of schools in sample	845	709	88	118	102
Estimated number of pupils in population (in thousands)	4,009	3,255	176	340	239
Percent of estimated number of pupils	100	81.2	4.4	8.5	6.0
MAT Total Reading mean	53.6	54.0	65.1	53.0	40.3
MAT Total Reading standard deviation	18.2	18.2	15.8	17.3	16.9
MAT Total Reading standard error of mean	0.25	0.30	0.96	0.93	1.20
Percent of pupils below the 50th percentile	51.0	50.0	25.0	54.0	79.0
Standard error below 50th	0.6	0.7	2.3	2.2	2.6
Percent of pupils below the 25th	25.0	24.0	6.0	24.0	55.0
Standard error below 25th	0.5	0.6	1.2	2.1	3.0

fifth-grade population or than the "heterogeneous" classrooms of nongrouped pupils. Further, 25 percent of the pupils in the "above-average" group in fact scored below the 50th percentile; 21 percent of the pupils in the "below-average" group did not score below the 50th percentile. On the basis of the Anchor Test Study data, approximately one quarter of the pupils assigned to above-average or below-average groups appear to have been misclassified. That is, with respect to national norms, these pupils' performance and their grouping category are not consistent. While some of this apparent misclassification may reflect local norms which are higher or lower than national norms, the magnitude of the difference warrants further consideration. The high degree of apparent misclassification of pupils in ability groups may well contribute to the apparent ineffectiveness of ability grouping as an educational technique, since the effectiveness of an instructional procedure tailored to student characteristics is dependent upon the precision (reliability) with which the characteristics are measured (Berliner and Cohen, 1973).

In the following sections, the relationships among reading achievement, ability grouping and several other variables will be explored.

5.1.3 Socioeconomic Level and Ability Grouping

Table 5-3 presents statistics from the Anchor Test Study by ability grouping and socioeconomic level (SEL). The practice of ability grouping appears more prevalent in low-SEL schools than in middle or high-SEL schools. Overall, 18.8 percent of all fifth-grade pupils were ability grouped. However, 25.8 percent of pupils in low-SEL schools were in some type of ability grouped classroom,as opposed to 16.1 percent in high-SEL schools and 16.9 percent in middle-SEL schools.

Within all three SEL categories, we observe that the mean MAT Total Reading score for ungrouped pupils exceeds the mean for the grouped pupils, although the difference is quite small for pupils enrolled in high and middle-SEL schools. Previous research has indicated that ability grouping is least effective (even harmful) for low ability students. If we assume that the concentration of such students is higher in low-SEL schools than in high or middle-SEL schools, then our observation that the largest

Table 5-3. -- Estimated number and percent of pupils and estimated MAT total reading mean, by socioeconomic level of school and ability grouping of classroom: Grade 5, United States, Spring 1972.

Classroom ability grouping	Socioeconomic level of school											
	Total			High			Middle			Low		
	Grade 5 pupils		Total reading mean	Grade 5 pupils		Total reading mean	Grade 5 pupils		Total reading mean	Grade 5 pupils		Total reading mean
	Number‡	Percent		Number‡	Percent		Number‡	Percent		Number‡	Percent	
Total	4,009	100.0	53.6	909	100.0	61.6	2,155	100.0	54.5	946	100.0	43.9
Not ability grouped:												
Total	3,255	81.2	54.0	763	83.9	61.7	1,790	83.1	54.6	702	74.2	44.3
Ability grouped:												
Total	754	18.8	51.9	146	16.1	61.1	365	16.9	54.0	244	25.8	42.7
Above average	176	4.4	65.1	45*	5.0*	68.8*	102	4.7	65.7	29*	3.1*	57.5*
Average	340	8.5	53.0	64*	7.0*	62.4*	151	7.0	53.9	125	13.2	47.1
Below average	239	6.0	40.3	38*	4.2*	50.1*	112	5.2	43.4	90	9.5	32.4

‡ Estimated number in thousands.

* Estimate based upon sample of less than 25 schools.

grouped/nongrouped difference occurs in low-SEL schools is quite consistent with previous research. If we consider the reverse of this logic, that high ability students are relatively more common in high-SEL schools, then we would anticipate findings favoring grouping in high-SEL schools if ability grouping benefits high ability students (Esposito, 1973). This difference was not observed in the Anchor Test study data. However, a more direct investigation of the interaction between grouping and pupil ability level will be performed in a later section (Section 5.1.5) where pupil IQ range and grouping are considered.

Referring again to Table 5-3, we note that ability grouped pupils in low-SEL schools are more likely to be in below average classes than are grouped pupils in either high or middle-SEL schools. This may contribute to the apparent negative effect of grouping at the univariate level presented in the previous section. Table 5-4 presents means for various grouping categories adjusted for SEL distributions within categories. The difference between grouped and ungrouped pupil means is reduced from 2.2 to 0.8 points by this adjustment.

We conclude from the tables presented in this section that the small difference between grouped and nongrouped pupils observed at the univariate level persists over all SEL categories. However, the difference is largely attributable to the fact that ability grouping is more commonly practiced in low-SEL schools than in either middle or high-SEL schools.

5.1.4 Pupil Racial/Ethnic Group and Ability Grouping

Table 5-5 contains statistics from the Anchor Test Study by ability grouping and pupil racial/ethnic group.* The practice of grouping appears to be applied differentially to pupils of different racial/ethnic characteristics. Minority pupils were enrolled in ability grouped classrooms more frequently than either Caucasian pupils or the total population. For all fifth-grade pupils in the Anchor Test Study sample, we observed that 18.8 percent were in grouped classrooms. However, 25.6 percent of

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*Due to the small number of pupils in other categories, data are reported only for Black, Spanish-surnamed and Caucasian pupils in Table 5-5.

Table 5-4.--Estimated MAT Total Reading mean and estimated MAT Total Reading mean adjusted for school SEL by ability grouping status: United States, spring, 1972

	Classroom Ability Grouping				
	Not grouped	All grouped categories	Above average	Average	Below average
Raw mean	54.0	51.8	65.1	53.0	40.3
Adjusted mean	53.8	53.0	64.5	54.2	42.3
Difference	-0.2	+1.2	-0.6	+1.2	+2.0

Table 5-5. -- Estimated number and percent of pupils and estimated MAT Total Reading mean, by racial group of pupil and by ability grouping of classroom: Grade 5, United States, spring 1972.

Classroom ability grouping	Racial/ethnic group of pupil											
	All pupils**			Black			Spanish-surnamed			Caucasian		
	Grade 5 pupils		Total reading mean	Grade 5 pupils		Total reading mean	Grade 5 pupils		Total reading mean	Grade 5 pupils		Total reading mean
	Number‡	Percent		Number‡	Percent		Number‡	Percent		Number‡	Percent	
Total	4,009	100.0	53.6	553	100.0	36.3	199	100.0	40.6	3,178	100.0	57.6
Not ability grouped:												
Total	3,255	81.2	54.0	405	73.2	36.5	148	74.4	41.1	2,640	83.1	57.6
Ability grouped:												
Total	754	18.8	51.9	148	26.8	35.8	51	25.6	39.1	538	16.9	57.6
Above average	176	4.4	65.1	16	2.9	49.9	8*	4.0*	54.7*	147	4.6	67.2
Average	340	8.5	53.0	60	10.8	40.0	23	11.6	39.9	252	7.9	57.4
Below average	239	6.0	40.3	72	13.0	28.9	20	10.0	32.3	139	4.4	47.5

‡ Estimated number in thousands.
* Estimate based upon sample of less than 25 schools.
** Includes all racial/ethnic groups.

Spanish-surnamed pupils and 26.8 percent of Black pupils were found to be in ability grouped classrooms. Further, these pupils were more likely than Caucasian pupils to be assigned to average or below average groups. These findings are consistent with the allegation noted by Esposito (1973) and Jencks (1972b) that ability grouping has the effect of increasing the concentration of minority pupils in low ability classrooms.

Results relating to achievement test performance by racial/ethnic group are mixed. Caucasian pupils, comprising 79.3 percent of the total fifth-grade population, evidence no difference in performance whether in grouped or nongrouped classes. That is, the mean MAT Total Reading score for nongrouped Caucasian pupils is exactly the same as the total population mean for Caucasians. Blacks and Spanish-surnamed pupils show a small difference favoring heterogeneous grouping (the not-ability-grouped mean is higher than the total mean for these two groups). The relatively small sample sizes involved for racial/ethnic groups other than Caucasian limits our confidence in these findings and the differences noted above are not significant.

We conclude that ability grouping appears to have little or no differential effect on pupils of different racial/ethnic origins except that minority pupils are taught in ability grouped classrooms more frequently than Caucasian pupils. The extent to which this is a consequence of the number of minority students enrolled in low-SEL schools (where grouping is more prevalent) is not known. If grouping were selectively applied to minority pupils, then the effect would be for low-SEL schools to exhibit relatively more ability grouping than middle or high-SEL schools. The present data do not allow us to make any causal statements concerning the reasons that minority pupils and low-SEL schools are involved in relatively more grouping than majority pupils or higher-SEL schools. Further examination of this phenomenon is in order to determine whether it represents racial or socioeconomic discrimination.

5.1.5 Reported IQ and Ability Grouping

Much of the research on the academic effects of ability grouping suggests that its effect may be different for pupils of different "ability." Ability grouping has sometimes been shown to be effective for "high ability" students but more often it appears to be ineffective or harmful to pupils of "low ability." The Anchor Test Study data discussed in Section 5.1.3 partially confirm this observation. Table 5-6 allows examination of the joint relationship of ability grouping and student IQ range.

We observe from Table 5-6 that ability grouping is applied about equally to pupils at all levels of IQ. For each of the four IQ range categories up to 111-125, the nongrouped pupils have the same mean as the total population, indicating no difference between ability grouped and not-grouped pupils at those levels. In the "above 125" range, there is a small but nonsignificant difference favoring heterogeneous grouping.

These findings do not provide any support for the proposition that ability grouping is beneficial for high ability pupils, since pupils in the "above 125" IQ range in nongrouped classrooms have a slightly higher mean than pupils in the same IQ range but in grouped classrooms. This lack of effect may be due to the fact that nearly half (47 percent) of grouped pupils in this range were in "average" or even "below average" groups where the effect of enrichment or acceleration would not be present. Such ambiguity is less present among pupils in the "below 75" IQ range. Here also, we found no difference between grouped and not grouped pupils and thus cannot provide support to the hypothesis that ability grouping is harmful to low ability students.

5.2 Classroom Enrollment

5.2.1 Previous Research

Like ability grouping, classroom enrollment has been a popular topic of educational research for many years. A review of the research literature by Shane (1961) identified studies dating back to 1896. Shane traced research through the 1920s and noted a decline in the number of studies performed on the effects of class size because most previous results had shown class size

Table 5-6. -- Estimated number and percent of pupils and estimated MAT Total Reading mean, by classroom ability grouping and by reported IQ of pupil: Grade 5, United States, Spring 1972.

Reported IQ of pupil	Classroom ability grouping								
	Total			Not ability grouped			Ability grouped		
	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean
	Number‡	Percent		Number‡	Percent		Number‡	Percent	
Total	4,009	100.0	53.6	3,255	81.2	54.0	755	18.8	51.8
Below 75	86	100.0	27.9	62	72.1	28.2	24	27.9	27.1
75-89	433	100.0	36.0	333	76.9	36.2	100	23.1	35.3
90-110	1,471	100.0	52.3	1,208	82.1	52.5	264	17.9	51.2
111-125	769	100.0	68.4	642	83.5	68.5	128	16.6	67.4
Above 125	209	100.0	78.4	173	82.8	78.5	37	17.7	75.8
Not reported	1,040	100.0	49.0	837	80.5	49.2	204	19.6	47.9

+Subcategories of ability grouped classrooms omitted.
‡Estimated number in thousands.

to have no effect. However, with the introduction of new methods of educational technology (computer-assisted instruction, television, etc.) in the late 1950s and early 1960s, interest in the effects of class size was rekindled. Presently, interest in the topic is also motivated by economic questions: how many pupils can be taught effectively in the same classroom? In a large school system, the difference between a maximum class size of 25 and one of 30 can mean a cost (or savings) of thousands of dollars in teacher salaries per year. Since class size limits are becoming a bargaining topic in teacher contracts (Education Daily, 1976), research on the subject has assumed new importance.

Class size is simply the number of pupils enrolled in a given classroom and is a rough indicator of the amount of human resources (teacher time) received by pupils. There is the possibility that resources (instructional time and/or services) will be differentially distributed to pupils within a classroom, so class size *per se* is by no means a perfect indicator of resources received. Some current studies of the effects of educational resources are being designed to capture this difference at the student level (Vanecko, *et al.*, 1976). Another indicator of the amount of teacher resources available to students is the pupil/teacher ratio, which is effectively class size divided by the number of instructional personnel. In a conventional classroom, class size and pupil/teacher ratio are interchangeable. However, when more than one adult is present in a classroom (as when team teaching or teacher aides are employed), an important difference between the two measures emerges. More resources are delivered to a pupil in a class of 40 with two teachers than a class of 30 with a single teacher. In the Anchor Test Study data, we cannot determine if the large classes in the sample have more than one teacher.

The presumed educational benefits of small class sizes derive from the opportunity for increased student/teacher contact. This allows the teacher to spend more time working with individual pupils as needed, allows the opportunity to learn the abilities (and limitations) of individual pupils more thoroughly, etc. In addition, small classes are easier to control than large classes, reducing the incidence of disciplinary problems and disruptions. For any given number of pupils in a school district, small classes are more expensive than large classes because they require the employment of more teachers and can even require additional classroom space. These economic costs are the primary significant reasons for not reducing class sizes.

Since reduction in the size of classes is expensive, can the practice be justified because it brings with it improved achievement? Current research literature based on large scale studies is uniform in finding that class size is _not_ significantly associated with achievement. In the _Equality of Educational Opportunity_ (Coleman, _et_ _al_., 1966), Coleman states:

> "pupil/teacher ratio shows a consistent lack of relation to achievement for all groups under all conditions." (p. 312)

Mosteller and Moynihan (1972) consider the Coleman report and its data to be the definitive study of the relationship between class size and achievement, finally documenting in unequivocal form the lack of association of class size and achievement. Coleman (1972) and Jencks (1972a), also writing in Mosteller and Moynihan's _On the Equality of Educational Opportunity_, concur that no relationship between class size and achievement can be found in the Coleman data.

Other studies focused more explicitly on class size policy decisions have reported similar findings. Dessart and Frandsen (1973) report reviewing studies of mathematics instruction in which class sizes up to 69 pupils were employed without unfavorable results. Carpenter and Hall (1971), in their report on the Office of Economic Opportunity performance contracting experiments, found that classes of 40 to 60 pupils show approximately the same levels of achievement as classrooms of 25 or fewer pupils. Averch, _et_ _al_. (1972) and Mayeske, _et_ _al_. (1970) report that "school resources," which include class size among other factors (such as teacher salaries, per pupil expenditure, etc.), account for somewhere between 1 percent and 5 percent of the variance in student achievement. Averch, _et_ _al_. (1972) conclude that "no school resource is consistently related to student outcomes."

Summers and Wolfe (1974) studied educational achievement in the Philadelphia public schools. Their conclusions were that low achieving pupils could be taught in classes of up to 28 pupils without detrimental effects, while other students could be enrolled in classes of up to 33 pupils without negative effects. The observation that low achieving pupils may benefit from smaller classes is the only way in which the general finding that class size is not related to achievement is challenged in the literature.

5.2.2 Findings from Anchor Test Study Data

Table 5-7 contains statistics from the Anchor Test Study by class size. Most (55.7 percent) of the fifth-grade pupils in 1972 were taught in classes having enrollments between 24 and 31. The median class size is estimated to be within the 28-31 pupil interval. Considering the extremes of the class size range, we find 14.1 percent of all fifth-grade pupils in classes of 23 or fewer pupils and 13.3 percent in classes of 35 or more.

There is no consistent pattern of differences in reading achievement means over the range of class size categories. Individual category means range from 52.0 to 54.9, compared to a total population mean of 53.6. No class size category mean is significantly different from the population mean. The difference between categories with the highest and lowest means (24-27 and 32-34) is 2.9 points and is statistically significant but small. Information concerning the proportion of pupils below the 50th and 25th percentiles confirms the observation made about mean MAT Total Reading scores: there is little difference among the class size categories. The standard deviations of the reading scores for each of the five class size categories are slightly larger than the population standard deviation, further evidence of the lack of a class size effect on achievement.

5.2.3 School Socioeconomic Level and Class Size

Some authors, such as Jencks (1972b), have suggested that the occasional finding that class size is associated with achievement is an artifact of the relationship of other variables to achievement. For example, a school district which has available the financial resources to support small classes may have other attributes which are known to have a direct relationship to achievement (such as high per-pupil expenditure on education or high community SES). Table 5-8 shows the joint relationship of class size and school SEL to achievement.

Table 5-7.--Statistics for fifth-grade sample and population from the Anchor Test Study by classroom enrollment: United States, spring, 1972

Statistic	Classroom enrollment					
	Total	1-23	24-27	28-31	32-34	35 or more
Number of pupils in sample	65,399	6,883	15,088	21,970	11,947	9,511
Number of schools in sample	845	273	299	360	209	133
Estimated number of pupils in population (in thousands)	4,009	564	946	1,286	678	535
Percent of estimated number of pupils	100	14.1	23.6	32.1	16.9	13.3
MAT Total Reading mean	53.6	53.0	54.9	53.8	52.0	53.5
MAT Total Reading standard deviation	18.2	18.7	18.6	18.7	19.1	18.6
MAT Total Reading standard error of mean	0.25	0.69	0.58	0.52	0.82	0.96
Percent of pupils below the 50th percentile	51.0	52.0	48.0	51.0	54.0	51.0
Standard error below 50th	0.6	1.5	1.3	1.2	1.8	2.2
Percent of pupils below the 25th percentile	25.0	26.0	22.0	25.0	29.0	25.0
Standard error below 25th	0.5	1.5	1.2	1.1	1.8	2.1

Table 5-8. -- Estimated number and percent of pupils and estimated MAT Total Reading mean, by socioeconomic level of school and by enrollment of classroom: Grade 5, United States, Spring 1972.

Enrollment of classroom	Socioeconomic level of school											
	Total			High			Middle			Low		
	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean
	Number‡	Percent		Number‡	Percent		Number‡	Percent		Number‡	Percent	
Total	4,009	100.0	53.6	909	100.0	61.6	2,155	100.0	54.5	946	100.0	43.9
1-23	564	14.1	53.0	96	10.6	62.6	312	14.5	53.9	156	16.5	45.4
24-27	946	23.6	54.9	252	27.7	61.8	504	23.4	55.6	191	20.2	43.9
28-31	1,286	32.1	53.8	324	35.6	61.4	680	31.6	54.3	283	29.9	44.0
32-34	678	16.9	52.0	122	13.4	60.0	376	17.4	54.3	180	19.0	41.8
35 or more	535	13.3	53.5	115	12.7	62.8	284	13.2	53.7	136	14.4	45.0

‡ Estimated number in thousands.

Inspection of the cell means in Table 5-8 indicates that there are no major differences among class size categories within levels of school SEL. However, the means of the SEL levels do not overlap one another. That is, all high-SEL class size categories have means in the 60s, all middle-SEL class size categories have means in the 50s and all low-SEL class size categories have means in the 40s.

There appear to be relatively more pupils from low-SEL schools and relatively fewer pupils from high-SEL schools in the 1-23 and 32-34 class size categories. This suggests that adjustment of the class size category means for school SEL differences may be informative. Table 5-9 contains the result of this adjustment. As can be seen from Table 5-9 the already small differences among class size categories are further reduced, leading to the conclusion suggested by Coleman, et al. (1966) and others, that class size has no consistent relationship to achievement.

5.2.4 Pupil Racial/Ethnic Group and Class Size

Table 5-10 presents statistics from the Anchor Test Study by class size and pupil racial/ethnic group. The MAT Total Reading mean differences observed for both class size and racial/ethnic group described elsewhere are fairly consistent within the rows and columns of this table. That is, the overall pattern of class size means is consistent within each racial/ethnic group and the ranking of racial/ethnic group means is relatively consistent within each class size category. (There are some exceptions to this latter statement, but those means are based on such small samples that our confidence in the data is severely limited.)

In Table 5-10 there appears to be a relationship between the population class size category mean and the relative number of Caucasian pupils in that category. For example, 82.7 percent of the pupils in the 24-27 pupil class size category are Caucasian (compared to 79.3 percent overall) and this category has the highest MAT Total Reading mean; the 32-34 pupil class size category is only 74.1 percent Caucasian and it has the lowest mean. Table 5.11 presents the results obtained when class size category means are adjusted for racial/ethnic group membership. This process also reduces the differences among class size categories, especially in the middle range of sizes (24-34 pupils), as did the adjustment for school SEL reported in Table 5.9.

Table 5-9.--Estimated MAT Total Reading mean and Estimated MAT Total Reading mean adjusted for school SEL, by classroom enrollment: United States, spring, 1972

Statistic	Classroom enrollment				
	1-23	24-27	28-31	32-34	35 or more
Raw mean	53.0	54.9	53.8	52.0	53.5
Adjusted mean	53.9	54.3	53.5	52.7	53.7
Difference	+0.9	-0.6	-0.3	+0.7	+0.2

Table 5-10. -- Estimated number and percent of pupils and estimated MAT Total Reading mean, by racial/ethnic group of pupil and by enrollment of classroom: Grade 5, United States, Spring 1972.

Enrollment of classroom	Racial/ethnic group of pupil											
	Total**			Black			Spanish-surnamed			Caucasian		
	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean	Grade 5 pupils		Total Reading mean
	Number‡	Percent		Number‡	Percent		Number‡	Percent		Number‡	Percent	
Total	4,009	100.0	53.6	553	100.0	36.3	199	100.0	40.6	3,178	100.0	57.6
1-23	564	14.1	53.0	66	11.9	35.7	31	15.6	42.3	453	14.3	56.5
24-27	946	23.6	54.9	119	21.5	37.3	33	16.6	39.2	782	24.6	58.3
28-31	1,286	32.1	53.8	172	31.1	36.9	67	33.7	40.0	1,026	32.3	57.7
32-34	678	16.9	52.0	114	20.6	35.0	44	22.1	39.3	502	15.8	57.1
35 or more	535	13.3	53.5	83	15.0	35.7	25	12.6	44.0	414	13.0	57.5

‡ Estimated number in thousands.

** Includes all racial/ethnic groups.

Table 5-11. -- Estimated MAT Total Reading mean and Estimated MAT Total Reading mean adjusted for pupil racial/ethnic group, by classroom enrollment: Grade 5, United States, spring, 1972

Statistic	Classroom enrollment				
	1-23	24-27	28-31	32-34	35 or more
Raw mean	53.0	54.9	53.8	52.0	53.5
Adjusted mean	52.8	54.4	53.8	53.0	53.9
Difference	-0.2	-0.5	0.0	+1.0	+0.4

5.3 Summary of Findings

In Chapter Five the univariate relationships of two classroom characteristics (classroom ability grouping and classroom enrollment) with reading achievement were examined. A review of the literature revealed that research conducted over the past 50 years concerning the effect of ability grouping on achievement has yielded mixed results: some studies have had positive findings, some negative findings and some null findings. This pattern of results is often interpreted to indicate that the practice of ability grouping among elementary school pupils has no relationship to achievement. Data from the Anchor Test Study sample support this conclusion, since only small univariate differences between grouped and nongrouped pupils were found. Because ability grouping appears more prevalent in low-SEL schools, these differences were adjusted for school SEL and were found to be reduced even further.

Some authors have suggested that ability grouping has some benefits for high ability pupils but is not effective (or may be harmful) for low-ability pupils. Examination of the grouped vs. nongrouped differences for varying levels of reported IQ indicated that there is no significant difference in either direction between grouped and nongrouped pupils at any level of IQ.

On the basis of the above analyses, there is no evidence that ability grouping is associated with differences in the academic performance of fifth-grade pupils, either positively or negatively. This is consistent with previous investigations of the topic. However, note that the *proportion of pupils who are ability grouped is considerably smaller than found in previous surveys*. The Anchor Test Study data can provide no information relevant to the debate over the affective and social effects of grouping. However, it is possible to conclude with some confidence that: *(a) the practice of ability grouping in elementary schools has no observable relationship to achievement; and (b) the practice appears to be declining in popularity*.

Class size is often identified as an important measure of school resources and educational "quality," yet reduction in class enrollment is very costly and its effect on achievement is debated. As was the case for ability grouping, previous studies of class size and its relationship to achievement have been inconsistent in their findings, although most large studies have found class size to be unrelated to achievement. The Anchor Test Study data contain no evidence to contradict this observation: class size was found essentially unrelated to reading achievement. Suggestions that there is some point beyond which achievement is adversely affected by increases in class size cannot be supported by this data, although the data may be too imprecise to locate such break points. In summary, for the range of class sizes contained in the Anchor Test Study sample, there is no consistent relationship between class size and reading achievement.

Neither class size nor ability grouping were found to have any significant relationship to reading achievement. Thus, the decision by a school to employ ability grouping or to reduce (or increase) class sizes should be made on considerations other than the possible effect such a decision would have on reading achievement. Further research is needed into the effect of class size since, as noted by Jencks (1972b), some of its actual effects may be obscured by a confounding of community characteristics (especially socioeconomic status) and class size: wealthier communities are more likely to have and to spend the monies necessary for smaller classes. Further, other variables that might also be related to achievement, such as teacher characteristics or curriculum methods, cannot be addressed by the present study but deserve further analysis. For example, why have some studies of ability grouping found it to be effective for high achievers (NEA, 1968)? Comparison of effective and not effective grouped classes may help to answer this question. Likewise, a controlled study of class size variation within schools of comparable size, SEL, and percent minority would provide a definitive answer to the questions which cannot be obtained from studies of naturally occurring variation. However, over the observed range of variation, neither ability grouping nor class size had any appreciable relationship to reading achievement.

6.0 CONCLUSIONS AND POLICY IMPLICATIONS

The present monograph has examined the relationship of certain school, classroom and pupil variables to reading achievement among fifth-grade pupils. Most of the school and pupil variables studied were found to have some relationship with achievement. Among school variables, the socioeconomic level of the school (SEL), a rough indicator of the affluence of the communities in which schools are located, and school control (Public vs. Non-public), showed strong relationships with achievement, while among pupil variables, primary language, diagnosed need for remedial reading and racial/ethnic group evidenced important relationships with achievement.

These observations are not surprising. The research literature on educational background variables has consistently found such factors to relate to achievement. In other cases, when considering such variables as remedial reading diagnosis or pupil primary language, the fact that such variables are related to reading achievement is almost a logical consequence of the variable itself. For example, performance on previous standardized tests of reading may well have been a factor in deciding that a particular pupil was in need of remedial services.

Most of the variables mentioned above represent educational parameters within which schools must operate. While knowledge of the relationship of such variables to reading achievement is important for an understanding of the learning process, they have few direct implications for the activities of schools and their personnel. However, the Anchor Test Study data base does contain three variables of policy interest: ability grouping, class size, and grade-five percent minority. Findings relating to these variables lead directly to statements about school practices.

The preceding analysis leads to the conclusion that class size and ability grouping variables have no important independent relationship to reading achievement. Pupils who are in grouped classrooms perform about the same as pupils in ungrouped classroom settings; likewise, pupils in classes of one size perform about the same as pupils in classes of any other size. On the other hand, the negative relationship between grade-five percent minority enrollment and reading achievement is substantially reduced but not entirely eliminated by the adjustments made in this study for school SEL and pupil racial/ethnic group.

Since we have found that ability grouping and class size appear to be unrelated to reading achievement, a school administrator may make changes in policy concerning these variables without expecting major positive or negative effects on reading achievement resulting from these changes alone. This is not to say that such changes will have no consequences whatever. The noncognitive effects of ability grouping have been the subject of much (albeit inconclusive) research; class size is an important issue in teacher union contracts and may be related to the ability of a teacher to maintain order in a classroom. The Anchor Test Study data base contains no information to allow us to investigate these issues, but further investigation of the noncognitive correlates of these two variables would be illuminating. In addition, a more detailed study of the independent effect of percent minority enrollment (perhaps in schools which are in the process of changing their racial balance through court-ordered desegregation) would test the findings we have obtained in another manner. We believe that additional research on the relationship between either class size or ability grouping and achievement on the national level would not be fruitful, given our results and a body of literature also finding no consistent relationships.

Another policy-related finding is the evidence of possible inequity or criterion discrepancy in the distribution of remedial reading services suggested by study of the remedial reading diagnosis variable. While diagnosis of need is not necessarily evidence of the delivery of services, it is a good proxy variable. Since it is not a direct measure, investigation using more exact measurement of service delivery is in order.

We observed that Black and Spanish-surnamed pupils appear to be diagnosed as needing remedial reading less often than Caucasian pupils at a given level of performance. Relative to Caucasian pupils, a disproportionately low number of minority pupils were diagnosed as needing remedial reading services when compared to the proportion of such students in the lowest quarter of the MAT Total Reading scale. In addition, twice as many Spanish-surnamed pupils were considered to have a handicap because their primary language is not English (30.7 percent) than were diagnosed as needing remedial reading (15.6 percent). While the proportion of Black and Spanish-surnamed pupils considered to require remedial reading instruction is greater than the proportion of Caucasians so diagnosed, other evidence suggests that their need is greater still.

The policy implication of this general finding is that the funding agencies which support compensatory reading programs (such as Title I or various state compensatory programs) should take steps to define and assure the equitable distribution of services, although more direct data on service delivery (rather than diagnosed need) will be necessary before taking any major actions.

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APPENDICES

APPENDIX A

SUMMARY OF SAMPLE DESIGN AND SURVEY METHODOLOGY

The sample design for the norming phase of the Anchor Test Study called for the selection of a stratified random sample of 940 schools from the universe of all public and non-public schools in the United States which contain at least one of the grades 4, 5, or 6.

Each school listed in the universe data source was assigned a measure of size based upon total enrollment in grades 4-6. After first having been grouped into 47 "major strata," schools were further subdivided into a total of 470 "final strata" of approximately equal aggregate size. The final strata were defined in such a way that schools within a given final stratum would be similar to one another in terms of the following variables (listed in the approximate order of priority in which they were used to define major and final strata):

- Control of school (Public, Catholic, Non-public Non-Catholic)
- Size of school system (schools in one of the 50 largest school districts, schools in other large counties, all other schools)
- Percentage of minority children in school or, if not available, percent minority in surrounding community (eight categories)
- Income level of community in which school is located (nine categories)
- Region of country in which school is located (four categories, based on Census classification)
- Degree of urbanization of community in which school is located (seven categories).

From each of the 470 final strata, two schools were selected randomly with probability proportional to size. This provided the primary norming phase sample of 940 schools.

At the same time the primary sample was selected, a set of up to five potential substitute schools was selected for each primary school. In addition, a "supplementary" sample of public schools not represented on the public school universe data file was selected. This sample consisted of 20 schools.

The research design called for administration of the Word Knowledge and Reading subtests of the Metropolitan Achievement Tests (MAT) to all 4th, 5th, and 6th grade pupils in each of the sampled schools, with the exception of pupils with severe language impediments and of pupils officially classified as mentally or emotionally handicapped.

The principal in each school was asked to appoint a School Coordinator to supervise the test administration process and to provide certain descriptive information about the school and about each classroom in grades 4-6. In addition, Test Administrators (usually the appropriate classroom teachers) were appointed to administer the MAT and to provide basic information about the characteristics of each pupil tested.

Of the 940 schools in the primary sample, 27 were found to be non-existant or otherwise ineligible, and 87 refused to participate in the study. The remaining 826 primary sample schools (90.4% of those eligible) did participate, and 80 of the 87 non-cooperating schools were replaced by appropriate substitute schools. Of the 20 "supplemental schools" selected, 12 (60%) participated in the study. Altogether, usable MAT test data were obtained for 192,749 pupils in a total of 918 schools.

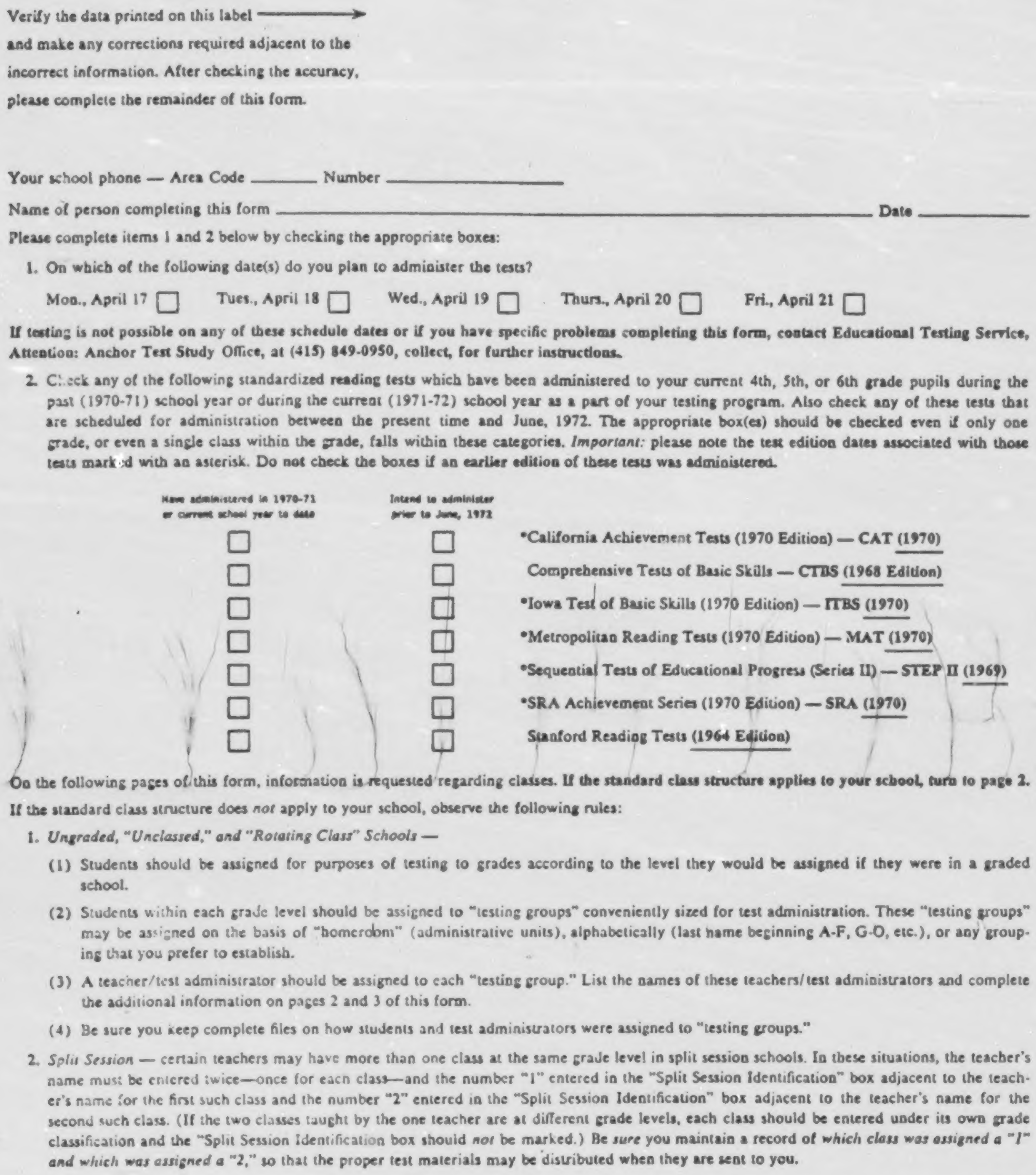
Each of these pupils was assigned a weight for use in estimation. The weight was the product of two components: a school weight (the inverse of the school's probability of selection, adjusted by grade for school nonresponse) and a pupil weight (consisting solely of a pupil nonresponse adjustment, since the design called for a 100% sample of grade-eligible pupils within each sampled school). In effect, the product of these two components indicates the approximate number of pupils in the total population (of 4th, 5th, or 6th graders, as the case may be) represented by any given pupil in the norming phase sample. For further information about the sample design and methodology of the Anchor Test Study, see the 1974 NCES publication: The Anchor Test Study: The Equating and Norming of Selected Reading Achievement Tests.

The tables contained in this report are based upon the norming phase sample of 65,399 grade five pupils, drawn from a total of 845 primary and substitute schools. Sixty-two schools in the original norming phase sample contained no fifth grade pupils and, thus, are not represented in the present analyses. The grade 5 "supplemental sample", consisting of 662 pupils from 11 schools, was also excluded from the analyses. One of several considerations leading to this exclusion was that because of the rather poor response rate for schools in this subsample, it was felt to be of questionable value in representing a small and somewhat obscure universe - public schools not included in the public school universe file.

APPENDIX B

FACSIMILES OF SCHOOL COORDINATOR AND TEST ADMINISTRATOR REPORT FORMS

1. School and Classroom Items, from School Coordinator's Report Form



Verify the data printed on this label ⟶
and make any corrections required adjacent to the
incorrect information. After checking the accuracy,
please complete the remainder of this form.

Your school phone — Area Code ________ Number ____________________

Name of person completing this form ____ Date ____________

Please complete items 1 and 2 below by checking the appropriate boxes:

1. On which of the following date(s) do you plan to administer the tests?

   Mon., April 17 ☐ Tues., April 18 ☐ Wed., April 19 ☐ Thurs., April 20 ☐ Fri., April 21 ☐

If testing is not possible on any of these schedule dates or if you have specific problems completing this form, contact Educational Testing Service, Attention: Anchor Test Study Office, at (415) 849-0950, collect, for further instructions.

2. Check any of the following standardized **reading tests** which have been administered to your current 4th, 5th, or 6th grade pupils during the past (1970-71) school year or during the current (1971-72) school year as a part of your testing program. Also check any of these tests that are scheduled for administration between the present time and June, 1972. The appropriate box(es) should be checked even if only one grade, or even a single class within the grade, falls within these categories. *Important:* **please note the test edition dates associated with those tests marked with an asterisk. Do not check the boxes if an earlier edition of these tests was administered.**

Have administered in 1970-71 or current school year to date	Intend to administer prior to June, 1972	
☐	☐	***California Achievement Tests (1970 Edition) — CAT (1970)**
☐	☐	**Comprehensive Tests of Basic Skills — CTBS (1968 Edition)**
☐	☐	***Iowa Test of Basic Skills (1970 Edition) — ITBS (1970)**
☐	☐	***Metropolitan Reading Tests (1970 Edition) — MAT (1970)**
☐	☐	***Sequential Tests of Educational Progress (Series II) — STEP II (1969)**
☐	☐	***SRA Achievement Series (1970 Edition) — SRA (1970)**
☐	☐	**Stanford Reading Tests (1964 Edition)**

On the following pages of this form, information is requested regarding classes. If the standard class structure applies to your school, turn to page 2.

If the standard class structure does *not* apply to your school, observe the following rules:

1. *Ungraded, "Unclassed," and "Rotating Class" Schools* —
   - (1) Students should be assigned for purposes of testing to grades according to the level they would be assigned if they were in a graded school.
   - (2) Students within each grade level should be assigned to "testing groups" conveniently sized for test administration. These "testing groups" may be assigned on the basis of "homeroom" (administrative units), alphabetically (last name beginning A-F, G-O, etc.), or any grouping that you prefer to establish.
   - (3) A teacher/test administrator should be assigned to each "testing group." List the names of these teachers/test administrators and complete the additional information on pages 2 and 3 of this form.
   - (4) Be sure you keep complete files on how students and test administrators were assigned to "testing groups."
2. *Split Session* — certain teachers may have more than one class at the same grade level in split session schools. In these situations, the teacher's name must be entered twice—once for each class—and the number "1" entered in the "Split Session Identification" box adjacent to the teacher's name for the first such class and the number "2" entered in the "Split Session Identification" box adjacent to the teacher's name for the second such class. (If the two classes taught by the one teacher are at different grade levels, each class should be entered under its own grade classification and the "Split Session Identification box should *not* be marked.) Be *sure* you maintain a record of *which class was assigned a "1" and which was assigned a "2,"* so that the proper test materials may be distributed when they are sent to you.

OE #2346

Instructions for Completing Pages 2 and 3:

List all of your classes at grades 4, 5, *and* 6 under the appropriate grade level heading. If one or more of these grade levels do not exist in you school, mark an "X" through the teacher identification area for that grade level. The following information is requested for each class:

Column 1 — *Class/Teacher Identification:* Print or type the name of each classroom teacher (or class identification) *within the area for that teacher's grade*. Some abbreviation may be necessary. Be sure the class/teacher identification is written *within the proper grade level*, either 4th, 5th, *or* 6th grade.

Column 2 — *Split Session Identification:* This area may be left blank unless certain grade levels in your school are on split sessions and certain teachers have more than one class. See the special instructions for Split Session identification on page 1.

Column 3 — *Number of pupils:* Enter the number of pupils actually enrolled in that teacher's class as of the day you receive this form.

Column 4 — *Physically Handicapped or Mentally Retarded?:* The "yes" box should be checked if this class is a special one separately organized for the physically handicapped or mentally retarded. Otherwise, check the "no" box.

Column 5 — *Ability Grouping:* Some schools establish classroom units *within grades* on the basis of student ability. If pupils have NOT been assigned to this teacher's class on the basis of ability, place a check in the "No Grouping" space. If pupils *have* been assigned to this teacher's class on the basis of ability, place a check in the space that best indicates the class ability level.

If you have more classes than space provided on this form, please attach a listing of the additional classes, using the format shown on pages 2 and 3. Supplementary pages 2 and 3 will be provided if it is possible to establish that a particular school may not have adequate space.

PLEASE PRINT OR TYPE

GRADE 4 CLASSES

	1 Class/Teacher Identification	2 Split Session Identification	3 Number of Pupils	4 Physically Handicapped or Mentally Retarded?		5 Ability Grouping			
						No Grouping (1)	Yes Grouping		
				Yes (1)	No (2)		Above Average (2)	Average (3)	Below Average (4)
Class 1		☐		☐	☐				
Class 2		☐		☐	☐				
Class 3		☐		☐	☐				
Class 4		☐		☐	☐				
Class 5		☐		☐	☐				
Class 6		☐		☐	☐				
Class 7		☐		☐	☐				
Class 8		☐		☐	☐				
Class 9		☐		☐	☐				
Class 10		☐		☐	☐				
Class 11		☐		☐	☐				
Class 12		☐		☐	☐				
Class 13		☐		☐	☐				
Class 14		☐		☐	☐				

1 Class/Teacher Identification	2 Split Session Identification	3 Number of Pupils	4 Physically Handicapped or Mentally Retarded?		5 Ability Grouping			
					No Grouping (1)	Yes Grouping		
			Yes (1)	No (2)		Above Average (2)	Average (3)	Below Average (4)
GRADE 5 CLASSES								
Class 1 ______	☐	______	☐	☐	__	__	__	__
Class 2 ______	☐	______	☐	☐	__	__	__	__
Class 3 ______	☐	______	☐	☐	__	__	__	__
Class 4 ______	☐	______	☐	☐	__	__	__	__
Class 5 ______	☐	______	☐	☐	__	__	__	__
Class 6 ______	☐	______	☐	☐	__	__	__	__
Class 7 ______	☐	______	☐	☐	__	__	__	__
Class 8 ______	☐	______	☐	☐	__	__	__	__
Class 9 ______	☐	______	☐	☐	__	__	__	__
Class 10 ______	☐	______	☐	☐	__	__	__	__
Class 11 ______	☐	______	☐	☐	__	__	__	__
Class 12 ______	☐	______	☐	☐	__	__	__	__
Class 13 ______	☐	______	☐	☐	__	__	__	__
Class 14 ______	☐	______	☐	☐	__	__	__	__
GRADE 6 CLASSES								
Class 1 ______	☐	______	☐	☐	__	__	__	__
Class 2 ______	☐	______	☐	☐	__	__	__	__
Class 3 ______	☐	______	☐	☐	__	__	__	__
Class 4 ______	☐	______	☐	☐	__	__	__	__
Class 5 ______	☐	______	☐	☐	__	__	__	__
Class 6 ______	☐	______	☐	☐	__	__	__	__
Class 7 ______	☐	______	☐	☐	__	__	__	__
Class 8 ______	☐	______	☐	☐	__	__	__	__
Class 9 ______	☐	______	☐	☐	__	__	__	__
Class 10 ______	☐	______	☐	☐	__	__	__	__
Class 11 ______	☐	______	☐	☐	__	__	__	__
Class 12 ______	☐	______	☐	☐	__	__	__	__
Class 13 ______	☐	______	☐	☐	__	__	__	__
Class 14 ______	☐	______	☐	☐	__	__	__	__

This page contains three questions that will help to describe your school and the population that it represents. Check the box and/or enter the information that best describes your school.

1. Which **one** of the following descriptions best defines the location of your school?

(1) ☐ Large city, over 500,000 population
(2) ☐ Large city, over 200,000 population
(3) ☐ Suburb of a large city
(4) ☐ Rural area near a large city
(5) ☐ Middle-size city, 50,000-200,000 population
(6) ☐ Suburb of a middle-size city
(7) ☐ Rural area near a middle-size city
(8) ☐ Small city or town, less than 50,000 population
(9) ☐ Rural area, not near a large or middle-size city

2. Estimate the percentages of pupils who come from households in which the total yearly income from all sources falls within the following ranges (be sure your percentages total 100%):

____% under $3,000
____% $3,000-$5,999
____% $6,000-$9,999
____% $10,000 and over
Total 100%

3. Give your best estimate of the percent of pupils in your school who are members of families whose primary means of support is a public welfare program.

None	1-10%	11-25%	26-50%	51-75%	76-90%	91-100%
☐	☐	☐	☐	☐	☐	☐
(1)	(2)	(3)	(4)	(5)	(6)	(7)

Prepared for the U. S. Office of Education under Contract OEC-0-71-4758 (284) by Educational Testing Service.

2. Pupil Items, from Test Administrator's Report Form

The Test Administrator provided answers to six questions on each pupil by gridding his responses on the pupil's answer sheet.

These questions, including the clarification given to the Test Administrator, follow:

1. Has the pupil been officially classified as handicapped by professional personnel other than a classroom teacher?

   Yes (Pupil has been officially classified as handicapped)
   No (Pupil is Not physically or mentally handicapped)
   Don't Know (Pupil might be considered handicapped but has not officially so classified)

2. Of which one of the following racial or national origin groups is this pupil a member?

   A. American Indian
   B. Negro
   C. Oriental
   D. Spanish Surnamed American (Cuban, Puerto Rican or Mexican descent)
   E. White (except Spanish-surnamed American) or other

3. Is this pupil's primary language English?

   Yes (go directly to question 5)
   No (go to question 4)

4. You have indicated that this pupil's primary language is not English. In your opinion, does this fact constitute a learning handicap for the pupil in Reading and most other academic subjects?

   Yes
   No
   Don't Know

5. Which of the following IQ ranges on your most recently administered standardized intelligence test best described this pupil?

   A. Below 75
   B. From 75 to 89
   C. From 90 to 110
   D. From 111 to 125
   E. Above 125
   F. No IQ test administered

6. Has this child been specifically diagnosed as needing corrective or remedial work in reading by someone other than the classroom teacher?

   Yes
   No
   Don't Know

APPENDIX C

SUMMARY OF STATISTICAL METHODOLOGY

The following describes the computational approach used in obtaining the statistics contained in this report:

Number of Sampled Pupils

n_j for any cell (j) is the simple count of the number of sampled pupils with usable MAT test scores who are classified as falling in cell j.

Number of Sampled Schools

s_j for any cell (j) is the simple count of the number of schools in the sample that contain one or more pupils with usable test scores who are classified as falling in cell j.

$s_j = n_j$, if all sampled pupils in cell j attend different schools. Otherwise,

$s_j < n_j$.

Estimated Total Number of Pupils

$\hat{N}_j$ for any cell (j) is the sum of the pupil weights (adjusted for nonresponse) of the pupils in cell j.

$$(1) \quad \hat{N}_j = \sum_{k}^{n_j} w_{jk}$$

where

n_j = the number of participating pupils in cell j,

w_{jk} = the weight assigned to the k^{th} participating pupil in cell j = the inverse of the probability of selection for that pupil, adjusted for non-response.

Estimated Percent of Pupils

Any cell j for a given table represents a specific combination of a column category (c) and a row category (r). If $\hat{N}_{(r,c)}$ denotes the estimated number of pupils in row r of column c and $\hat{N}_{(T,c)}$ denotes the estimated total number of pupils in all rows of column c, the percent, $\hat{P}_j$, of all pupils in the population in column category c that fall in cell (r,c) is estimated as follows:

$$(2) \quad \hat{P}_j = \hat{P}_{(r,c)} = 100 \times \hat{N}_{(r,c)}/\hat{N}_{(T,c)}$$

Estimated Mean

$\bar{x}_j$ is the weighted sum of the MAT Total Reading scores of the pupils in cell j divided by the estimated number of pupils in cell j.

(3) If $x'_j = \sum_{k}^{n_j} w_{jk} x_{jk}$

where

x_{jk} = the MAT Total Reading score for the kth participating pupil in cell j,

(4) $\bar{x} = x'_j/\hat{N}_j$.

Estimated Standard Deviation

$\hat{\sigma}_j$ is the square root of the weighted sum of squared differences between the score of each pupil in cell j and the estimated mean for cell j, divided by the estimated number of pupils in cell j:

$$(5) \quad \hat{\sigma}_j = \sqrt{(1/\hat{N}_j) \sum_{k}^{n_j} w_{jk}(x_{jk} - \bar{x}_j)^2}.$$

Equivalently, the following "computational formulas" may be used for estimating $\hat{\sigma}_j$:

(6) If $B_j = \sum_{k}^{n_j} w_{jk}\, x_{jk}^2$

$$(7) \quad \hat{\sigma}_j = \sqrt{B_j/\hat{N}_j - \bar{x}_j^2}$$

Estimated Proportion Below Median (50th Percentile)

$\hat{p}50_j$ is the estimated number of pupils in cell j whose MAT Total Reading score is 54 or below divided by the estimated total number of pupils in cell j (54 is the MAT Total Reading scale median raw score, according to Anchor Test Study national norms):

$$(8) \quad \text{If } C_j = \sum_k^{n_j} w_{jk}\delta_{jk}$$

where

$$\delta_{jk} = 0 \text{ if } x_{jk} > 54 \text{ and}$$

$$\delta_{jk} = 1 \text{ if } x_{jk} \leq 54,$$

$$(9) \quad \hat{p}50_j = C_j/\hat{N}_j.$$

Estimated Proportion Below 25th Percentile

$\hat{p}25_j$ is the estimated number of pupils in cell j whose MAT Total Reading score is 38 or below divided by the estimated total number of pupils in cell j (39 is the MAT Total Reading score below which 25% of fifth grade pupils fall, according to Anchor Test Study national norms):

$$(10) \quad \text{If } D_j = \sum_k^{n_j} w_{jk}\delta_{jk}$$

where

$\delta_{jk} = 0$ if $x_{jk} > 38$ and

$\delta_{jk} = 1$ if $x_{jk} \leq 38$,

$$(11) \quad \hat{p}25_j = D_j/\hat{N}_j.$$

Estimated Standard Error of the Mean*

The mean for any cell j may be viewed as a ratio, r_j, of the following form:

$$(12) \quad r_j = x_j'/y_j'$$

where

$x_j' = \sum_k^{n_j} w_{jk} x_{jk}$ (as before), and

$y_j' = \hat{N}_j = \sum_k^{n_j} w_{jk}$ (as before).

---

*Based upon Sample Survey Methods and Theory, Vol. 1, by Hansen, Hurwitz, and Madow, chapter 4.

The estimated standard error of a ratio is given by:

$$(13)\quad \hat{\sigma}_{r_j} = \sqrt{r_j^2\, \hat{V}_{r_j}^2}$$

where

$\hat{V}_{r_j}^2$ is the estimated rel-variance of the ratio r_j.

The critical term in this formula is $\hat{V}_{r_j}^2$, which is composed of three independently estimated elements:

$$(14)\quad \hat{V}_{r_j}^2 = v_{x_j'}^2 + v_{y_j'}^2 - 2v_{x_j'y_j'}$$

For the Anchor Test Study, the formulas for these three components derive from the fact that the primary sample design consisted of 470 (final) strata, each of which contained two schools:

$$(15)\quad v_{x_j'}^2 = s_{x_j}^2/(x_j')^2 = (1/x_j')^2 \sum_h^L (x_{h1j}' - x_{h2j}')^2$$

where

L = the total number of strata = 470

x_{h1j}' is computed as x_j' (equation 3) for the pupils in cell j from one of the schools in stratum h.

x_{h2j}' is computed as x_j' for the pupils in cell j from the other school in stratum h. Note that, because the difference is squared, it does not matter whether a given school is classified as number 1 or number 2.

Note also that, if one of the schools selected in stratum h did not actually participate in the Anchor Test Study, x'_{h1j} or x'_{h2j} will be zero. Also, if cell j does not contain any of the pupils in one of the schools selected in stratum h, the x'_{h1j} or x'_{h2j} will be zero.

Analogously,

$$(16)\quad v^2_{y'_j} = s^2_{y'_j}/(y'_j)^2 = 1/(y'_j)^2 \sum_h^L (y'_{h1j} - y'_{h2j})^2 \text{, and}$$

$$(17)\quad v_{x'_j y'_j} = s_{x_j y_j}/x'_j y'_j = (1/x'_j y'_j) \sum_h^L (x'_{h1j} - x'_{h2j})(y'_{h1j} - y'_{h2j}$$

The sample estimates, $v^2_{x'_j}$, $v^2_{y'_j}$, and $v_{x'_j y'_j}$ given by equations (15), (16), and (17) are substituted into equation (14) to provide an estimate of $V^2_{r_j}$. This estimate is then substituted into equation (13), along with the value of $r_j (=\bar{x}_j)$ to provide an estimate, $\hat{\sigma}_{r_j}$, of the standard error of the mean.

APPENDIX D

SAMPLING ERRORS AND STATISTICAL SIGNIFICANCE

1. Statistical Significance of the Difference Between Two Means

Because of the large sample sizes upon which most estimates of MAT Total Reading scale means are based in the present study, the z statistic is appropriate for testing the statistical significance of differences between means. This statistic is defined as follows:

$$(1) \qquad z = \frac{\bar{x}_1 - \bar{x}_2}{\hat{\sigma}_d}$$

where $\bar{x}_1$ and $\bar{x}_2$ are the two means being compared, and $\hat{\sigma}_d$ is the estimated standard error of the difference between the two means.

The z statistic is normally distributed with a standard deviation of one. Thus, a $z > 1.96$ (in absolute value) indicates statistical significance at the $p < .05$ level, i.e., the probability that the two populations being compared have identical "true" means, given the obtained difference in estimated means, is less than 5/100. Similarly, a $z > 2.56$ (in absolute value) indicates statistical significance at the $p < .01$ level.

In computing z, the critical term is $\hat{\sigma}_d$, which is defined as follows:

$$(2) \qquad \hat{\sigma}_d = \sqrt{\hat{\sigma}^2_{\bar{x}_1} + \hat{\sigma}^2_{\bar{x}_2} - 2\hat{\sigma}_{\bar{x}_1\bar{x}_2}},$$

where $\hat{\sigma}_{\overline{x}_1}$ is the estimated standard error of the first mean,

$\hat{\sigma}_{\overline{x}_2}$ is the estimated standard error of the second mean, and

$\hat{\sigma}_{\overline{x}_1 \overline{x}_2}$ is the estimated covariance of the two means.

Two of these three elements are easily obtained: the standard errors corresponding to all means discussed in this report are presented in Appendix E. The third element, the covariance term, is zero whenever the two means being compared are based upon entirely different samples of schools. This is the case whenever the two means involve different categories of any school-level variable (e.g., pupils attending high socioeconomic levels schools vs. pupils attending low socioeconomic level schools, or public school black pupils vs. nonpublic school black pupils).

Whenever the two means being compared are not based upon entirely different samples of schools, the covariance term is not exactly zero. Nor is the term easily computed. In such cases, a conservative (i.e., too small) approximation of z may be obtained by simply ignoring the covariance term, as follows:

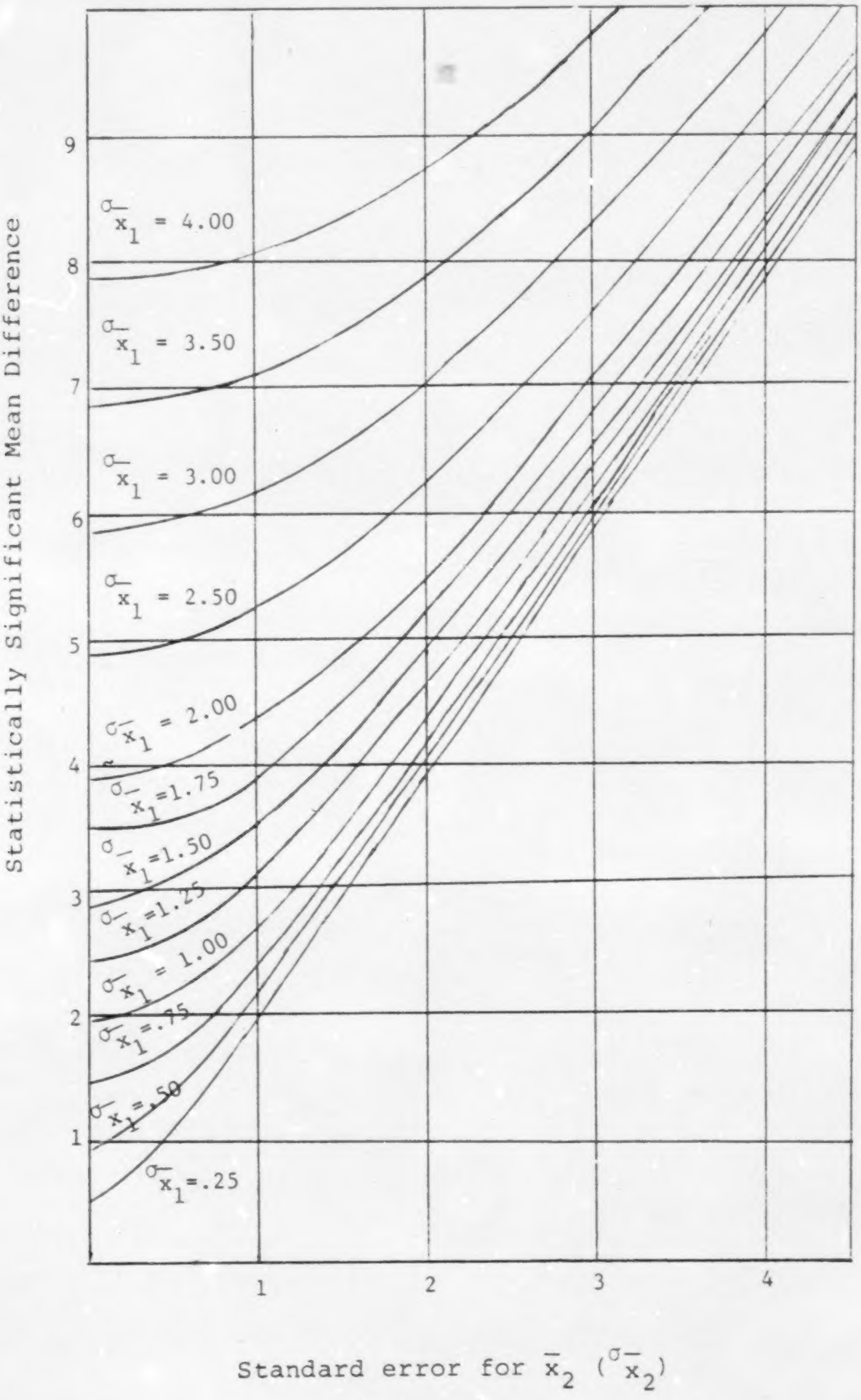
$$(3) \qquad z = \frac{\overline{x}_1 - \overline{x}_2}{\hat{\sigma}_d} \simeq \frac{\overline{x}_1 - \overline{x}_2}{\sqrt{\hat{\sigma}^2_{\overline{x}_1} + \hat{\sigma}^2_{\overline{x}_2}}}$$

To examine the extent to which equation (3) underestimates the exact z in situations where the covariance term is theoretically non-zero, covariances were computed for 192 pairs of Anchor Test Study means, all of which were based upon overlapping samples of schools (e.g., Black pupils who attend schools with 1-10% minority enrollment vs. Caucasian pupils who attend schools with 1-10% minority enrollment). The covariance was found to be less than 0.02 for 172 (93%) of these pairs. The single largest covariance was 0.197 and, even in that extreme case, the approximate $\hat{\sigma}_d$ differed from the exact $\hat{\sigma}_d$ by only 0.21%.

On the basis of these findings, it appears that the covariance term in equation (2) may be safely ignored in statistical comparisons between pairs of means estimated from the Anchor Test Study sample and that equation (3) provides a simple and accurate way of assessing the statistical significance of the difference between any two such means.

Figure D-1 is included for the convenience of readers who may wish to make frequent determinations of statistical significance. To use these graphs, one begins by looking up in the Appendix E tables the standard errors which correspond to the two means being compared. Having located one standard error on the abscissa (horizontal axis) of Figure D-1, the reader moves up the figure until encountering the curve which corresponds (or approximately corresponds) to the second standard error and then reads across the figure to find the "critical mean difference" needed for statistical significance at $p < .05$, given the two standard errors. If the two means differ by more than this value, the difference is "statistically significant". The results of this procedures are the same as would be obtained through use of equation (3).

Figure D-1. Mean difference needed for statistical significance at $p < .05$ level, as a function of the standard errors of the two means being compared.



2. Generalized Variance Estimates for Cell Means

For each estimated MAT Total Reading scale mean computed during analysis of data from the Anchor Test Study, an estimate of the corresponding standard error of the mean was also computed (see Appendix E). These standard errors provide valuable information about the extent to which estimates of individual means are subject to inaccuracy as a result of sampling error. As described in the previous section, they are also necessary for assessing the statistical significance of differences between means.

Unfortunately, estimates of standard errors are themselves subject to sampling error and tend to be unreliable when computed from samples containing a small number of schools. The remainder of this section describes a "generalized" method of estimating standard errors of the mean. For samples consisting of less than 25 schools,* this method is considered superior to the computational procedures which were used to produce the estimates contained in the Appendix E tables (see Appendix C for a description of these computational procedures). All Appendix E standard errors which were computed from samples of less than 25 schools are marked by asterisks to alert the reader to the fact that they are of questionable accuracy and that the generalized estimation method described below is recommended.

In developing generalized variance procedures, the variance of an estimated mean ($\sigma^2_{\bar{x}}$) was written as follows:

(1) $$\sigma^2_{\bar{x}} = K \frac{\sigma^2}{n},$$

---

*This criterion was based on a rough estimate of 15% for the coefficient of variation (c.v.) of the estimated standard error of the mean for samples consisting of 24 schools (see Hansen, Hurwitz, and Madow, 1953, p. 135). With a c.v. of 15%, there is only about a 50% chance that the estimated mean will be within 10% of the actual population mean.

where K = the design effect, which is the ratio of the variance of $\bar{x}$ for the Anchor Test Study design to the variance of $\bar{x}$ that would have been obtained if a simple random sample of the same total size (n) had been used.

σ^2 = the estimated variance of the test scores for all pupils in the cell, and

n = the total number of sampled pupils in the cell, as given in the Appendix E tables.

The following expression for the standard error of the mean follows directly from equation (1):

$$\sigma_{\bar{x}} = \sqrt{K}\,\frac{\sigma}{\sqrt{n}} \qquad (2)$$

Letting f represent $\sqrt{K}\,\sigma$, $\sigma_{\bar{x}}$ can be written:

$$\sigma_{\bar{x}} = f/\sqrt{n}. \qquad (3)$$

The generalized variance estimation method involves a set of procedures for obtaining approximate values of f for two-way classifcation cells containing less than 25 sampled schools. Once this f-value is obtained for a given cell, $\sigma_{\bar{x}}$ may be estimated directly from equation (3).

Table D-1 lists f-values for the univariate (marginal) categories of all independent variables examined in the present study. These values were obtained from the following equation, easily derived from equation (3):

Table D-1. Univariate f factors.

Variable categories	f factor
School location	
Greater than 500,000	105.5
200,000 - 500,000	106.7
50,000 - 199,999	73.2
Less than 50,000	78.1
Suburbs	64.0
Rural, near city	62.8
Rural	62.0
School SEL	
High	51.0
Medium	65.6
Low	74.4
School control	
Public	63.9
Private	44.5
Pupil Racial/Ethnic group	
American Indian	51.9
Black	43.7
Oriental	26.4
Spanish-surnamed	42.4
Caucasian	47.2
Not Reported	64.2
Pupil remedial reading diagnosis	
Diagnosed need	29.7
No need diagnosed	61.1
Not Reported	51.3
Class ability grouping	
Not ability grouped	68.5
Above average	53.6
Average	71.3
Below average	78.3
Class size	
1 - 23	57.2
24 - 27	71.2
28 - 31	77.1
32 - 34	89.6
35 and over	93.6
School percent minority	
0	45.1
1 - 10	52.6
11 - 35	57.3
36 - 75	59.5
76 - 100	59.5
Pupil reported IQ	
Less than 75	13.1
75 - 89	22.1
90 - 110	34.0
111 - 125	22.3
Greater than 125	16.4
Not Reported	70.4
Primary language	
English	60.0
Not English	32.0
Not English, handicapped handicapped	23.1
Not Reported	54.8

(4) $$f = \sqrt{n}\,\sigma_{\bar{x}}.$$

The f-value for a given two-way classification cell is simply the smaller of the two univariate f's for the catagories which define the cell. For example, suppose we wished to determine f for American Indian pupils who attend suburban schools. The f for American Indian pupils is shown in Table D-1 to be 51.9, and the f for suburban schools is 64.0. The smaller of these two values, 51.9 is inserted in equation (3) to obtain the generalized estimate of $\sigma_{\bar{x}}$ for this cell.

There are two situations for which the above rule should be modified in order to obtain a precise estimate of $\sigma_{\bar{x}}$:

a) If the larger of the two univariate f's is above 80, the smaller value should be increased by 10% to obtain f for the two-way cell; and

b) If the larger of the two univariate f's is below 45, the smaller value should be decreased by 10% to obtain f for the two-way cell.

APPENDIX E

REFERENCE TABLES

NOTE: These reference tables correspond to the 2 and 3-way tables discussed in the text of the report and are numbered accordingly. They contain statistics which are useful in interpreting the accuracy of the estimates reported in text tables and are needed for certain statistical comparisons - the number of schools and pupils in the Anchor Test Study sample and the estimated standard error of the mean. Additional statistical information for these and other tables is presented in the Preliminary Tabular Report (see Appendix F).

Appendix Table 2-5--Number of schools and pupils in Anchor Test Study sample and estimated standard error of the mean, by control of school and by school location: Grade 5, United States, Spring 1972

School location+	Control of school								
	Total			Public			Nonpublic		
	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean
Total	845	65,399	0.25	740	60,407	0.26	105	4,992	0.63
City over 500,000	88	8,866	1.12	72	7,908	1.14	16	958	2.12*
City of 200,000-500,000	38	2,817	2.01	30	2,346	2.21	8	471	2.08*
City of 50,000-200,000	93	6,917	0.88	78	6,415	0.96	15	502	1.15*
City/town under 50,000	210	16,955	0.60	180	15,822	0.65	30	1,133	1.01
Suburb of city of 50,000 or more	161	14,578	0.53	134	12,839	0.57	27	1,739	0.87
Rural area near city	99	7,192	0.74	94	7,053	0.76	5	139	0.88*
Rural area not near city	156	8,074	0.69	152	8,024	0.69	4	50	4.36*

* Estimate based upon sample of less than 25 schools.

+ Text table contains fewer school location categories.

Appendix Table 2-7--Number of schools and pupils in Anchor Test Study sample and estimated standard error of the mean, by socioeconomic level of school and by school location: Grade 5, United States, Spring 1972

School location+	Socioeconomic level of school											
	Total			High			Middle			Low		
	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean
Total	845	65,399	0.25	188	15,484	0.41	451	35,119	0.35	206	14,796	0.62
City over 500,000	88	8,866	1.12	13	1,132	1.16*	43	4,366	1.43	32	3,368	1.28
City of 200,000-500,000	36	2,817	2.01	7	462	2.62*	15	1,194	1.52*	16	1,161	2.37*
City of 50,000-200,000	93	6,917	0.88	24	2,235	1.04*	53	3,803	0.82	16	879	2.93*
City/town under 50,000	210	16,955	0.60	42	3,366	0.99	120	9,808	0.69	48	3,781	1.29
Suburb of city of 50,000 or more	161	14,578	0.53	80	7,074	0.56	73	6,855	0.60	8	649	3.72*
Rural area near city	99	7,192	0.74	11	828	1.50*	68	4,895	0.84	20	1,469	1.46*
Rural area not near city	156	8,074	0.69	11	387	1.90*	79	4,198	0.85	66	3,489	1.20

* Estimate based upon sample of less than 25 schools.

+ Text table contains fewer school location categories.

Appendix Table 2-9--Number of schools and pupils in Anchor Test Study sample and estimated standard error of the mean, by control of school and by socioeconomic level of school: Grade 5, United States, Spring 1972

Socioeconomic level of school	Control of school								
	Total			Public			Nonpublic		
	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean
Total	845	65,399	0.25	740	60,407	0.26	105	4,992	0.63
High	188	15,484	0.41	159	14,073	0.43	29	1,411	0.92
Middle	451	35,119	0.35	391	32,239	0.37	60	2,880	0.61
Low	206	14,796	0.62	190	14,095	0.63	16	701	2.24*

* Estimate based upon sample of less than 25 schools.

Appendix Table 2-10--Number of schools and pupils in Anchor Test Study sample and estimated standard error of the mean, by Grade 5 percent minority of school and by school location: Grade 5, United States, Spring 1972

School location+	Grade 5 percent minority of school																	
	Total			0			1-10			11-35			36-75			76-100		
	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean
Total	845	65,399	0.25	220	12,107	0.41	309	25,369	0.33	161	13,156	0.50	70	6,177	0.77	85	8,642	0.64
City over 500,000	88	8,866	1.12	7	357	2.89*	16	1,575	1.62*	16	1,336	1.80*	15	1,206	1.84*	34	4,392	0.98
City of 200,000-500,000	38	2,817	2.01	6	281	1.78*	11	828	1.04*	7	635	2.20*	3	203	2.55*	13	870	1.76*
City of 50,000-200,000	93	6,917	0.88	13	664	1.28*	38	2,774	0.86	28	2,365	1.00	7	658	2.93*	7	456	1.92*
City/town under 50,000	210	16,955	0.60	59	3,473	0.80	76	6,135	0.66	46	4,181	0.74	17	1,846	1.74*	12	1,370	1.22*
Suburb of city of 50,000 or more	161	14,578	0.53	42	3,463	0.89	87	8,207	0.55	17	1,646	1.35*	10	839	1.81*	5	423	3.68*
Rural area near city	99	7,192	0.74	34	2,141	0.81	37	3,103	1.00	21	1,408	1.30*	5	381	0.29*	2	159	0.82*
Rural area not near city	156	8,074	0.69	61	1,778	0.91	44	2,747	0.96	26	583	1.47	13	994	1.04*	12	972	1.82*

* Estimate based upon sample of less than 25 schools.

+ Text table contains fewer school location categories.

Appendix Table 2-12--Number of schools and pupils in Anchor Test Study sample and estimated standard error of the mean, by control of school and by grade 5 percent minority of school: Grade 5, United States, Spring 1972

Grade 5 percent minority of school	Control of school								
	Total			Public			Nonpublic		
	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean
Total	845	65,399	0.25	740	60,407	0.26	105	4,992	0.63
0	220	12,107	0.41	169	10,070	0.48	51	2,037	0.66
1-10	309	25,369	0.33	277	23,381	0.34	32	1,988	1.05
11-35	161	13,154	0.50	153	12,723	0.51	8	431	2.28*
36-75	70	6,177	0.77	66	5,953	0.69	4	174	4.07*
76-100	85	8,642	0.64	75	8,280	0.61	10	362	2.79*

* Estimate based upon sample of less than 25 schools.

Appendix Table 2-13--Number of schools and pupils in Anchor Test Study sample and estimated standard error of the mean, by socioeconomic level of school and by grade 5 percent minority of school: Grade 5, United States, Spring 1972

Grade 5 percent minority of school	Socioeconomic level of school											
	Total			High			Middle			Low		
	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean
Total	845	65,399	0.25	188	15,484	0.41	451	35,119	0.35	206	14,796	0.62
0	220	12,107	0.41	53	3,280	0.70	133	7,495	0.55	34	1,332	1.12
1-10	309	25,369	0.33	105	9,489	0.53	169	13,556	0.38	35	2,324	1.10
11-35	161	13,154	0.50	25	2,297	1.11	97	8,373	0.63	39	2,484	0.88
36-75	70	6,177	0.77	5	418	2.95*	31	2,998	0.86	34	2,711	1.16
76-100	85	8,642	0.64	0	0	--	21	2,697	1.53*	64	5,945	0.59

* Estimate based upon sample of less than 25 schools.

Appendix Table 4-1--Number of schools and pupils in Anchor Test Study sample and estimated standard error of the mean, by racial/ethnic group of pupil and by primary language of pupil: Grade 5, United States, Spring 1972

Primary language of pupil	Racial/ethnic group of pupil											
	Total**			Black			Spanish-surnamed			Caucasian		
	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean
Total	845	65,399	0.25	396	10,218	0.43	322	3,375	0.73	813	50,573	0.21
English	844	62,600	0.24	393	10,074	0.44	287	1,666	0.75	813	49,985	0.21
Not English -- not considered handicapped	134	724	1.19	5	30	3.06*	93	562	1.10	57	101	2.77
Not English -- considered handicapped	196	1,226	0.66	15	15	3.73*	126	1,041	0.68	82	127	1.91
Not reported	211	849	1.88	28	99	1.35	55	106	1.61	111	360	1.43

* Estimate based upon sample of less than 25 schools.

** Includes all racial/ethnic groups.

Appendix Table 4-2--Number of schools and pupils in Anchor Test Study sample and estimated standard error of the mean, by racial/ethnic group of pupil and by reported IQ of pupil: Grade 5, United States, Spring 1972

Reported IQ of pupil	Racial/ethnic group of pupil											
	Total**			Black			Spanish-surnamed			Caucasian		
	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in. sample	Standard error of mean
Total	845	65,399	0.25	396	10,218	0.43	322	3,375	0.73	813	50,573	0.21
Not reported	731	16,977	0.54	242	4,303	0.58	164	1,380	1.03	674	10,731	0.41
Reported:												
Below 75	337	1,478	0.34	132	744	0.44	49	137	1.08	247	568	0.57
75-89	663	7,217	0.26	220	2,135	0.40	120	617	0.66	608	4,360	0.30
90-110	737	23,905	0.22	267	2,604	0.69	194	1,022	0.82	705	19,994	0.20
111-125	705	12,408	0.20	122	383	1.69	106	196	1.04	677	11,649	0.19
Above 125	577	3,414	0.28	28	49	3.76	21	23	4.09*	556	3,271	0.26

* Estimate based upon sample of less than 25 schools.

** Includes all racial/ethnic groups.

Appendix Table 4-3--Number of schools and pupils in Anchor Test Study sample and estimated standard error of the mean, by racial/ethnic group of pupil and by socioeconomic level of school: Grade 5, United States, Spring 1972

Socioeconomic level of school	Racial/ethnic group of pupil											
	Total**			Black			Spanish-surnamed			Caucasian		
	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean
Total	845	65,399	0.25	396	10,218	0.43	322	3,375	0.73	813	50,573	0.21
High	188	15,484	0.41	66	462	1.90	80	223	1.57	188	14,534	0.39
Middle	451	35,119	0.35	183	3,891	0.82	173	1,700	1.22	442	28,953	0.27
Low	206	14,796	0.62	147	5,865	0.45	69	1,452	0.83	183	7,086	0.57

** Includes all racial/ethnic groups.

Appendix Table 4-5--Number of schools and pupils in Anchor Test Study sample and estimated standard error of the mean, by racial/ethnic group of pupil and by control of school: Grade 5, United States, Spring 1972

Control of school	Racial/ethnic group of pupil											
	Total**			Black			Spanish-surnamed			Caucasian		
	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean
Total	845	65,399	0.25	396	10,218	0.43	322	3,375	0.73	813	50,573	0.21
Public	740	60,407	0.26	364	9,670	0.39	286	3,218	0.73	715	46,203	0.22
Nonpublic	105	4,992	0.63	32	348	2.23	36	157	2.18	98	4,370	0.52

** Includes all racial/ethnic groups.

Appendix Table 4-6--Number of schools and pupils in Anchor Test Study sample and estimated standard error of the mean, by racial/ethnic group of pupil and by remedial reading diagnosis for pupil: Grade 5, United States, Spring 1972

Remedial reading diagnosis for pupil	Racial/ethnic group of pupil											
	Total**			Black			Spanish-surnamed			Caucasian		
	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean
Total	845	65,399	0.25	396	10,218	0.43	322	3,375	0.73	813	50,573	0.21
Diagnosed need	625	5,803	0.39	189	1,383	0.47	120	513	0.79	554	3,821	0.42
No diagnosed need	840	55,377	0.26	368	7,802	0.52	289	2,558	0.83	804	44,182	0.22
Not reported	517	4,219	0.79	158	1,033	0.82	87	304	2.11	447	2,570	0.74

** Includes all racial/ethnic groups.

Appendix Table 4-8--Number of schools and pupils in Anchor Test Study sample and estimated standard error of the mean, by grade 5 percent minority of school and by racial/ethnic group of pupil and socioeconomic level of school: Grade 5, United States, Spring 1972

Racial/ethnic group of pupil and socioeconomic level of school	Grade 5 percent minority of school														
	Total			0-10			11-35			36-75			76-100		
	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean
Total**	845	65,399	0.25	529	37,476	0.33	161	13,154	0.50	70	6,127	0.76	85	8,642	0.64
Black	396	10,218	0.43	145	353	1.33	115	1,618	0.72	60	1,988	0.89	76	6,259	0.71
High SEL	66	462	1.90	45	96	2.31	18	324	1.76*	3	42	11.71*	0	0	--
Middle SEL	183	3,891	0.82	75	168	1.87	65	941	0.98	25	777	1.75	18	2,005	1.63*
Low SEL	147	5,865	0.45	25	89	2.42	32	353	1.24	32	1,169	0.85	58	4,254	0.57
Spanish-surnamed	322	3,375	0.73	147	306	1.09	96	726	1.03	43	857	1.15	36	1,486	0.99
High SEL	80	223	1.57	56	111	2.04	19	97	1.58*	5	15	4.94*	0	0	--
Middle SEL	173	1,700	1.22	80	169	1.18	62	508	1.31	24	606	1.58*	7	417	2.26*
Low SEL	69	1,452	0.83	11	26	4.74*	15	121	1.78*	14	236	1.47*	29	1,069	0.99
Caucasian	813	50,573	0.21	528	36,571	0.24	161	10,446	0.56	70	2,983	0.77	54	573	1.47
High SEL	188	14,534	0.39	158	12,487	0.40	25	1,814	1.39	5	233	1.60*	0	0	--
Middle SEL	442	28,953	0.27	302	20,595	0.31	97	6,707	0.66	31	1,499	0.89	12	152	3.15*
Low SEL	183	7,086	0.57	68	3,489	0.76	39	1,925	0.91	34	1,251	1.47	42	421	1.58

* Estimate based upon sample of less than 25 schools.

** Includes all racial/ethnic groups.

Appendix Table 5-3--Number of schools and pupils in Anchor Test Study sample and estimated standard error of the mean, by socioeconomic level of school and by classroom ability grouping: Grade 5, United States, Spring 1972

Classroom ability grouping+	Socioeconomic level of school											
	Total			High			Middle			Low		
	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean
Total	845	65,399	0.25	188	15,484	0.41	451	35,119	0.35	206	14,796	0.62
Not ability grouped:												
Total	709	52,131	0.30	161	13,120	0.42	388	28,642	0.40	160	10,369	0.73
Ability grouped:												
Above average	88	3,123	0.96	22	747	1.75*	46	1,790	1.03	20	586	2.83*
Average	118	5,883	0.93	23	991	0.93*	48	2,755	1.18	47	2,137	1.42
Below average	102	4,262	1.20	17	626	2.60*	50	1,932	1.81	35	1,704	1.18

* Estimate based upon sample of less than 25 schools.

+ Text table contains additional row, for which appendix statistics are unavailable.

Appendix Table 5-5--Number of schools and pupils in Anchor Test Study sample and estimated standard error of the mean, by racial/ethnic group of pupil and by classroom ability grouping: Grade 5, United States, Spring 1972

Classroom ability grouping+	Racial/ethnic group of pupil											
	Total**			Black			Spanish-surnamed			Caucasian		
	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean
Total	845	65,399	0.25	396	10,218	0.43	322	3,375	0.73	813	50,573	0.21
Not ability grouped:												
Total	709	52,131	0.30	328	7,186	0.51	259	2,496	0.80	685	41,506	0.24
Ability grouped:												
Above average	88	3,123	0.96	30	306	3.49	22	148	4.31*	81	2,573	0.85
Average	118	5,883	0.93	58	1,287	1.28	45	372	1.74	110	4,139	0.74
Below average	102	4,262	1.20	50	1,439	0.60	28	359	2.15	93	2,355	1.30

* Estimate based upon sample of less than 25 schools.

** Includes all racial/ethnic groups.

+ Text table contains additional row, for which appendix statistics are unavailable.

Appendix Table 5-6--Number of schools and pupils in Anchor Test Study sample and estimated standard error of the mean, by classroom ability grouping and by reported IQ of pupil: Grade 5, United States, Spring 1972

Reported IQ of pupil	Classroom ability grouping														
	Total			Not ability grouped			Ability grouped+								
							Above average			Average			Below average		
	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean
Total	845	65,399	0.25	709	52,131	0.30	88	3,123	0.96	118	5,883	0.93	102	4,262	1.20
Below 75	337	1,478	0.34	271	1,022	0.46	10	18	4.13*	31	108	1.08	49	330	0.48
75-89	663	7,217	0.26	550	5,370	0.31	39	133	1.29	85	748	0.96	78	966	0.66
90-110	737	23,905	0.22	620	19,257	0.26	73	886	0.86	99	2,438	0.75	83	1,324	1.08
111-125	705	12,408	0.20	592	10,237	0.23	72	912	0.56	93	985	0.87	52	274	1.68
Above 125	577	3,414	0.28	486	2,799	0.31	56	335	0.70	53	226	1.27	22	54	2.67*
Not reported	731	16,977	0.54	613	13,446	0.56	63	839	1.90	96	1,378	1.92	72	1,314	1.89

* Estimate based upon sample of less than 25 schools.

+ Text table contains statistics only for ability grouped total.

Appendix Table 5-8--Number of schools and pupils in Anchor Test Study sample and estimated standard error of the mean, by socioeconomic level of school and by enrollment of classroom: Grade 5, United States, Spring 1972

Enrollment of classroom	Socioeconomic level of school											
	Total			High			Middle			Low		
	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean
Total	845	65,399	0.25	188	15,484	0.41	451	35,119	0.35	206	14,796	0.62
1-23	273	6,883	0.69	53	1,279	1.05	141	3,789	0.77	79	1,815	1.37
24-27	299	15,088	0.58	75	4,128	0.79	161	7,879	0.67	63	3,081	1.48
28-31	360	21,970	0.52	85	5,659	0.69	186	11,699	0.61	89	4,612	1.07
32-34	209	11,947	0.82	38	2,334	1.15	119	6,512	0.81	52	3,101	1.43
35 or more	133	9,511	0.96	26	2,084	1.07	72	5,240	1.07	35	2,187	2.06

Appendix Table 5-10--Number of schools and pupils in Anchor Test Study sample and estimated standard error of the mean, by racial/ethnic group of pupil and by enrollment of classroom: Grade 5, United States, Spring 1972

Enrollment of classroom	Racial/ethnic group of pupil											
	Total**			Black			Spanish-surnamed			Caucasian		
	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean	Schools in sample	Pupils in sample	Standard error of mean
Total	845	65,399	0.25	396	10,218	0.43	322	3,375	0.73	813	50,573	0.21
1-23	273	6,883	0.69	104	986	1.57	75	409	1.41	256	5,324	0.57
24-27	299	15,088	0.58	135	2,041	0.95	89	537	1.57	287	12,308	0.44
28-31	360	21,970	0.52	168	3,285	0.64	135	1,208	1.34	343	17,103	0.40
32-34	209	11,947	0.82	107	2,159	0.92	74	759	1.27	194	8,708	0.57
35 or more	133	9,511	0.96	59	1,747	1.17	52	462	1.79	124	7,130	0.68

** Includes all racial/ethnic groups.

APPENDIX F

LIST OF TABLES CONTAINED IN PRELIMINARY TABULAR REPORT

TABLES

(Note: All tables are for grade 5, United States, spring 1972, and all tables consist of four (4) subtables, which present the following statistics:

Subtable A:	Number of pupils in sample and estimated mean MAT Total Reading score;
Subtable B:	Estimated standard deviation and estimated standard error of the mean for MAT Total Reading score;
Subtable C:	Estimated proportions of pupils with MAT Total Reading score below the 50th and 25th percentiles;
Subtable D:	Estimated total number and percent of pupils.

Tables differ only in the combination of variables for which the above statistics are presented, as indicated below.)

1A-D Socioeconomic level of school by location of school. . . . .

2A-D Control of school by location of school . . . .

3A-D Control of school by socioeconomic level of school. . .

4A-D Racial-ethnic group of pupil by location of school. . .

5A-D Primary language of pupil by location of school . . . .

6A-D Remedial reading diagnosis for pupil by location of school. . . . .

7A-D Reported IQ of pupil by location of school. . . . . . .

8A-D Racial-ethnic group of pupil by socioeconomic level of school . . . .

9A-D Primary language of pupil by socioeconomic level of school. . . . .

10A-D Remedial reading diagnosis for pupil by socioeconomic level of school . . . .

11A-D Reported IQ of pupil by socioeconomic level of school. . . . .

12A-D Racial-ethnic group of pupil by control of school . . .

13A-D Primary language of pupil by control of school. . . . .

14A-D Remedial reading diagnosis for pupil by control of school. . . . .

15A-D Reported IQ of pupil by control of school . . . .

16A-D Socioeconomic level of school by control and location of school . . . .

17A-D Racial-ethnic group of pupil by control and location of school. . . . .

18A-D Primary language of pupil by control and location of school. . . . .

19A-D Remedial reading diagnosis for pupil by control of school. . . . .

20A-D Reported IQ of pupil by control and location of school. . . . .

21A-D Racial-ethnic group of pupil by control and socioeconomic level of school . . . .

22A-D Primary language of pupil by control and socioeconomic level of school . . . .

23A-D Remedial reading diagnosis for pupil by control and socioeconomic level of school . . . .

24A-D Reported IQ of pupil by control and socioeconomic level of school . . . .

25A-D Racial-ethnic group of pupil by socioeconomic level and location of school . . . .

26A-D Primary language of pupil by socioeconomic level and location of school . . . .

27A-D Remedial reading diagnosis for pupil by socioeconomic level and location of school. . . . .

28A-D Reported IQ of pupil by socioeconomic level and location of school. . . . .

29A-D Remedial reading diagnosis for pupil by racial-ethnic group of pupil. . . . .

30A-D Remedial reading diagnosis for pupil by racial-ethnic group of pupil and socioeconomic level of school. . . .

31A-D Remedial reading diagnosis for pupil by racial-ethnic group of pupil and location of school . . . .

32A-D Remedial reading diagnosis for pupil by racial-ethnic group of pupil and control of school. . . . .

33A-D Grade 5 percent minority in school by socioeconomic level and location of school. . . . .

34A-D Grade 5 percent minority of school by racial-ethnic group of pupil and socioeconomic level of school. . . .

35A-D Grade 5 percent minority of school by racial-ethnic group of pupil and location of school . . . .

36A-D Grade 5 percent minority of school by remedial reading diagnosis for pupil . . . .

37A-D Ability grouping of class by socioeconomic level and location of school . . . .

38A-D Ability grouping of class by racial-ethnic group of pupil and socioeconomic level of school . . . . . .

39A-D Ability grouping of class by racial-ethnic group and reported IQ of pupil . . . .

40A-D Enrollment of class by socioeconomic level and location of school . . . .

41A-D Enrollment of class by racial-ethnic group of pupil and socioeconomic level of school. . . . .

42A-D Enrollment of class by racial-ethnic group of pupil and location of school . . . .

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